ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. 70. CHICAGO, SATURDAY, JANUARY 27, 1917 No. 4

Tree Trimming

IN a few weeks the tree-trimming campaigns will make their appearance in many cities throughout the country. Tree trimming is a necessary evil in many localities whether to prevent interference between trees and overhead conductors, eliminate dense shadows cast by street lights, or remove possible dangers. Tree trimming is as much a public service as it is an advantage to the utility. And yet, it is often a source of complaint and the cause of ill-feeling between private property owners and the local utility that trims the trees, resulting in endless trouble and annoyance and even expense to the company and the city. In many localities it is necessary to canvass the private property owners for permission to cut their trees and then that of the civic commissioners before it is permissible to commence to trim. While this is usually troublesome where numerous property owners have to be solicited, and many difficulties and delays arise, it is generally the quicker way in the end.

When the utility trims the trees its employees cannot be reminded too often that by their behavior and their work is the utility judged, by the property owners at least. Many owners justly take a pride in the trees along their property, and a feeling of resentment this year may develop into stubborn opposition next year and one frequently expensive to allay.

The utility public trimming trees will serve the best interests of itself, its patrons and the city it aims to develop by always practicing consideration for the feelings of others. Making special effort to explain that the trimming of the trees is as necessary for public as for individual good, will tend to placate opposition and disarm hostility. And no one thing will do more to allay opposition once and for all than to endeavor to trim the trees well and carefully.

Unfortunately, tree trimming is generally done in the early months of the year, when the tree is undergoing the natural awakening of life. Under the warmth of the sun the sap—the very life of the tree—has commenced to rise from the roots to the branches. When the branches are trimmed this sap or liquid superates from the cut, the greater quantity exuding from the south side of the tree. As the liquid bleeding from the wounds is the very life of the tree, care should be taken that these be left in proper condition for rapid healing, and healing will not occur until the bark grows over the wound. In cutting the limb cut in such a way that the bark, in growing over the cut will not form a pocket into which water can collect, for when this occurs rot surely sets in. The wound should be left in a proper condition therefore by a knife, and the whole covered by suitable paint. The paint used should be one free from volatile oils, and preferably of such a color that harmonize with its surroundings, that the cut may be as inconspicuous as possible. These are small items, but nevertheless, very important.

Trees well trimmed and well kept are a source of pride to their owners, an asset to any city and an eloquent testimony to the public utility's policy toward local improvement. Therefore, treat the trees well.

Municipal Ownership Without Proper Consideration

IN connection with the proposed plan of the Board of Supervisors of Hudson County, N. J., to enlarge the municipal electric plant now employed for service for the court house at Jersey City, to a sufficient capacity to provide for the lighting of all county buildings and roads, it is interesting to note the status of municipal ownership up to the present time in this territory. The suggestion, which has been presented before to the County Freeholders, gives evidence of rather haphazard methods of procedure, unless expert engineering advice is obtained as to the specific engineering possibilities of the proposition.

The county has maintained for the past 20 years a municipal lighting plant at Laurel Hill entirely apart from the court-house station, for the operation of the street-lighting system on the Hudson Boulevard. It has been shown that this municipal property has cost about 100 per cent more to operate than the different municipalities in the county are paying the Public Service Electric Company for service, yet the plant has been operated continuously, even though the equipment in the past few years has reached a point of great inefficiency. Regardless of cost conditions, a proposition is now under consideration to install a new lighting plant for the Boulevard system. This is municipal ownership without regard—municipal ownership that has for its precept a profitless desire to continue the operation of the station because it happens to be a county

property, in reality, according to the records, almost a county charge.

Whether the same condition prevails with the court-house plant and the suggested plan to augment the capacity remains to be seen; it has been asserted that the plant is being run at a cost in excess of the local rate of central-station service. A venture of this nature to be a good economic proposition should be inaugurated with utmost discretion, coupled with a complete expert investigation prior to the inception of any concrete plan or accordant expenditure, particularly where satisfactory service is already available.

Certainly there is nothing in municipal ownership when it demands twice the amount of the local charge as made by the private company, excepting possibly the satisfaction of local officials and to gratify this whim is hardly a profitable investment for property owners and taxpayers. Not only should thorough investigations be made but complete data should be compiled and public meetings held for a discussion of the question in order that all interested may pass upon the merits of the proposition. Public opinion would not be likely to sanction the plan if it lacked the necessary qualifications to bring utmost efficiency and economy in operation and public opinion is entitled to a hearing. Extravagance in municipal ownership makes municipal ownership inconsistent.

Subdiving Plant Investment Costs

THE study of a large number of utility exhibits prepared for use in commission cases leads one to the conclusion that much improvement is now being made in the way of clarifying cost data. Progressive companies are realizing that it is no longer sufficient to transcribe work orders and partial contract data for scrutiny by regulating boards, and are going to what might seem the limit of painstaking in the preparation of their cases. This applies especially to companies which are obliged to go before a state board in order to secure permission to issue additional securities. In the most advanced practice we find operating companies submitting not only the originals or sworn copies of contracts for equipment and agreements with customers, but including in their material photographs of the plants during construction and after completion, blue prints showing stations in cross-section, line-construction drawings and many other engineering information sheets which are of the greatest value in enabling the commission to reach the conclusion that the money expended or that is desired has a proper basis of "demand."

There is one particular, however, in which further improvement is desirable, and that is in reference to the subdivision of plant costs. It is common to find operating companies submitting data of a rather disjointed character, often including the cost of auxiliary equipment with the expenditure for prime movers, and perhaps tying up boiler expenses with outlays for stokers, pumps or other machinery. The settlement of bills on periodical schedules also tends to make the preparation of intelligible cost data a little difficult, unless the sheets submitted are carefully noted as to the amount of apparatus that they include and the dates during which the construction set forth took place. Even if lump sum contracts cover a variety of equipment, a company should be able to at least estimate with fair accuracy the relative costs of the different items, and in this way the public utility commission sitting in the case will have a clearer basis for its action, in case it is questioned by the public or by other interests relative to the grounds for its decision.

In view of these facts the far-sighted central-station manager will give the commissioners enough cost material to enable them to justify their position to the layman in case he visits the commission office bent on inquiring into costs; and incidentally, the preparation of such complete material is of the greatest value to the operating company itself from the standpoint of future estimates. It is becoming recognized that it is quite as important to look after these matters as it is to save heat units in station operation.

The Electric Flashlight

The National Fire Protection Association, in a recently issued bulletin, points out that the small boy cultivates the habit of striking matches because the blaze of light created thereby appeals to some primal impulse of his nature that reasoning with or punishing him will not overcome. It is urged that the toy feature of the match be replaced with something of a similar nature by which the dangerous element is eliminated and the electric flashlight is suggested as a substitute which will compete very favorably with the match.

The wisdom of this advice from the standpoint of fire prevention cannot be overestimated. Neither is the small boy alone at fault. Electric lighting in the home has done much to reduce the fire hazard, but there are innumerable places about the house where some auxiliary temporary light is needed and the electric flashlight serves exceptionally well in this connection.

Also, electric flashlights of many different types and sizes have become almost invaluable for a great variety of uses out of doors, particularly by campers, motorists, etc.

It is within the province of the electrical industry to foster a wider use of the electric flashlight because it comes within the popular conception of an electrical device, and its use therefore tends to increase the usefulness and popularity of electricity and, furthermore, the profits from the sale of these devices in the aggregate are well worth while to the industry.

HAPPENINGS IN THE INDUSTRY

Convention of N. E. L. A. to Be Held at Atlantic City—Commercial Section Meetings in Chicago—Indiana New-Business Meeting—Important Decision in Central Union Telephone Case—Electrical Inspectors Convention at Toledo—Plans for Wire-Your-Home Time—Ohio New-Business Meeting

NATIONAL ELECTRIC LIGHT ASSOCIATION TO MEET IN ATLANTIC CITY.

President Wagner Announces Fortieth Annual Meeting Will Be Held Last Week of May.

Announcement is made by H. A. Wagner, president of the National Electric Light Association, that the fortieth annual convention of the Association will be held at Atlantic City, N. J., and the date will probably be May 29 to June 1. Definite arrangements have not as yet been completed in regard to hotel accommodations and the final dates will depend some what upon the accommodations that can be secured.

Plans for the convention have been under way for some time, as it has been definitely known that the choice for the meeting place was between Pittsburgh, Pa., and Atlantic City. It is understood that the unusual hotel facilities at the latter place finally made it advisable to decide upon the famous seashore resort as the meeting place.

COMMITTEES OF COMMERCIAL SECTION, N. E. L. A., HOLD MEETINGS.

Merchandising and Publication Committees Make Reports—General Plans Discussed.

Meetings of the Executive, Merchandising and Publications Committees of the Commercial Section, National Electric Light Association, were held January 20 and 22, at the Hotel Sherman, Chicago. The purpose of these meetings was to consider reports on the work thus far accomplished by the present administration, to make plans for future work and for the commercial sessions at the next convention.

At the meeting of the Merchandising Committee, presided over by Chairman J. V. Guilfoyle, of the United Electric Light & Power Company, New York, among other important matters was considered a movement that has been instituted to induce furniture manufacturers to provide outlets on different articles of furniture, such as tables, sideboards, etc., thereby insuring greater convenience in the use of electrical appliances in the home. Attention was also given to methods of providing outlets for appliances on indirect and semi-indirect lighting fixtures.

Progress on the work of preparing two new pamphlets was reported at the meeting of the Publication Committee, at which Chairman F. D. Pembleton, of the Public Service Company of New Jersey, presided. The two publications will be entitled "Wiring of New Houses" and "Wiring of Old Houses." The former will be an attractive booklet designed for distribution by central stations to guide home-builders, architects and contractors in the proper installation of electrical devices in new homes. The booklet on "Wiring of Old Houses" will be of simple design, prepared for use in connection with house-wiring campaigns, such as "Wire-Your-Home Time," to be conducted by the Society for Electrical Development, from April 1 to May 15.

Meetings of the Executive Committee were held January 22, with Chairman E. A. Edkins, of the Commonwealth Edison Company, Chicago, in the chair, at which reports of the various committees of the section were made and general plans discussed for the work to be done before the next convention of the association.

INDIANA RANGE CAMPAIGN DISCUSSED BY NEW-BUSINESS COMMITTEE.

General Plans Formulated at Muncie Meeting for State-Wide Drive on Electric Cooking.

At a meeting of the New-Business Committee of the Indiana Electric Light Association, held at Muncie January 23, the outstanding feature of a well prepared program was a general discussion of the state-wide electric cooking campaign proposed at a meeting of the same committee last fall. The idea has taken such a good hold among Indiana central-station men that after this week's meeting of new-business managers there now practically remains only the final arrangements for the first state campaign for the introduction of electric ranges

The meeting, at which there was an attendance of nearly 100, was called to order by Chairman O. M. Booher, of Kokomo, who introduced S. W. Greenland, of Fort Wayne, president of the association. The latter, in welcoming those present, stated the important place held by commercial departments in the central-station business and added that their success spelt success for the industry. Especially important, he said, was the new-business manager at the present time, when coal and copper costs were high, calling for greater commercial and engineering ability.

The first paper to be presented was on "New Industrial Applications of Central-Station Service," by R. W. Mercer, of the General Electric Company, Indianapolis, in which was given descriptions of heating and enamelling ovens, steel and brass furnaces, together with methods of operation and advantages of their use. The discussion, which was chiefly confined to electric furnaces, was started by A. E. Oltz, of Hammond, who gave operating data on a six-ton Heroult furnace, operating on three-phase service at about 40-per-cent load-factor and consuming 600 to 700 kilowatt-hours per ton of product. He pointed out that the electric furnace was a conveniently installed means for the production of steel from scrap. O. M. Drischel, of Marion, claimed that operation of furnaces on single-phase lines was the most efficient for the consumer but difficult for the central station because of load fluctuations, and R. L. Buhrman, of the Haynes Stellite Company, Kokomo, spoke of the satisfactory operation of an electric furnace on single-phase service. R. A. McGregor, of Indianapolis, pointed out that the quality of product was a big argument for the electric furnace. He also spoke of the success of electric forge furnaces, and R. Thurman, of Muncie, about that of core-baking ovens. Mr. Mercer concluded by saying the reduction in time of operation was one of the advantages of the electric furnace.

Discussion on Electric Cooking Campaign.

Chairman Booher then brought up the subject of the state campaign on electric cooking, outlining what had been done by the committee and how the plans had progressed. He introduced H. W. Alexander, of the Society for Electrical Development, who stated that the movement was bound to succeed and prove beneficial to Indiana and all central stations, that the campaign could be best directed by an appointed manager with methods used in national campaigns, this work to be supplemented by local activities of central stations. He laid particular emphasis on the necessity of co-operation to accomplish results and on the point that the idea of electric

cooking and service should be sold. His attitude was very optimistic, tending to dispell any fears of the movement not being a success. R. B. Woolley, of Toledo, gave the details of the proposed concerted plan, stating that the campaign would be started by April 1, beginning by published articles in the newspapers by prominent men, followed by "teaser" advertisements to excite the curiosity of the public. Then the whole plan would be announced, which would include baking contests in each town, the winners to be awarded electrical devices as prizes, and probably sent to Indianapolis to participate in another contest, all of which would yield a large amount of publicity. He was followed by R. A. McGregor, who first suggested the state-wide campaign, and who outlined some of the results that could be obtained by co-operating in the movement. W. M. Fagan, of Chicago, and J. H. Risser, of Kokomo, also participated in the discussion, which was closed with the recommendation that the plan be submitted by letter to the central stations for their approval, with the suggestion that immediate action be taken in order that the campaign be commenced.

The meeting was adjourned to the Kirby Hotel, where a banquet was held, T. F. English, of the Muncie Electric Light Company, presiding as toastmaster. After-luncheon talks were made by a number of Muncie business men.

Central-Station Advertising.

The afternoon session was opened by a paper by T. F. Kelly, of Dayton, O., on "Profitable Central-Station Advertising." Mr. Kelly listed the different mediums for successful publicity, stating the advantages of each and commenting on methods. He closed by laying stress on "good-will" advertising, classing it as a most valuable asset to any central-station company. R. A. McGregor, in discussion, stated the value of indirect advertising, such as newspaper publicity that has real news value. He said a central station was known by its good manners—the courtesy of its employees. Prof. C. F. Hardy, of Purdue University, commented on the rising importance of commercial men in the industry, an influence now entering greatly into the training of engineers. N. A. Perry, of Indianapolis, told of some successful advertising done in connection with selling ranges in that city.

"The Wiring of Existing Buildings" was the title of a paper read by J. P. Ohmer, of Elkhart, who outlined the methods used and results of a successful house-wiring campaign conducted by the Indiana & Michigan Electric Company in Elkhart. In the discussion, R. Thurman gave the results of a campaign in Muncie, and M. S. Caldwell those of an all-the-year campaign in South Bend, both exceptionally successful. P. H. Palmer and R. M. Booher concluded the discussion, after which the meeting adjourned. Many of those in attendance took advantage of an opportunity to visit the plant of the Ball Brothers Glass Manufacturing Company.

IMPORTANT DECISION IN CENTRAL UNION TELEPHONE CASE.

Judge Dever Holds Stock Held by American Telephone & Telegraph Company Null and Void.

In the case of William A. Read et al., vs. Central Union Telephone Company, court holds stock of A. T. & T. in Central Union Telephone Company null and void, orders an accounting, and holds American company cannot recover any part of its alleged indebtedness from the Central Union company until after full accounting.

Judge William E. Dever, sitting as a judge in the Superior Court of Cook County, before whom suit brought by certain minority stockholders of the Central Union Telephone Company, Chicago, against the American Telephone & Telegraph Company, was tried, has handed down an opinion dealing with all of the intricate questions of law and fact which were involved in this new famous litigation. Some idea of the magnitude of this case can be gathered from the fact stated by the court that the record covered some 30,000 pages and included hundreds of intricate exhibits.

The suit was started four years ago next month by William A. Read and other stockholders of the Central Union company and subsequently A. A. Beebe, Ernest M. Kimball, Frederick W. Schwamb and other Chicago stockholders intervened in the proceeding as co-complainants. The defendants in the suit were the American Telephone & Telegraph Company, of New York, the parent company of the Bell system, the Central Union Telephone Company and all of its officers and directors, including President Theodore N. Vail and Vice-President Union N. Bethell, of the American Telephone & Telegraph Company, and B. E. Sunny, president, and H. F. Hill, vice-president of the Chicago and Central Union companies. The Western Electric Company was also made a party defendant to the proceeding.

Judge Dever held that all of the stock, having a par value of some $5,200,000, held by the American Telephone & Telegraph Company in the Central Union company was null and void because under Section 26 of the general incorporation law of the State of Illinois a foreign corporation doing business in Illinois can exercise only such powers as can be exercised by Illinois corporations of like character and under the decisions of the Supreme Court of this state an Illinois corporation cannot own stock in another company engaged in the same line of business.

As a further ground for holding the stock of the American company illegal and void, the court held that the inevitable tendency of the purchase of stock in the Central Union and other Bell subsidiary companies, such as the Chicago company, the Western Electric Company and other subsidiary companies was to suppress competition in the telephone business and to create a monopoly of such business, and the court held that under the decisions of the Supreme Court of Illinois, notably the case of Dunbar against the American Telephone & Telegraph Company, it was illegal for an Illinois or foreign corporation to buy up stock of an Illinois corporation when such purchase would have the tendency to suppress competition.

Referring to the public utility law which was passed after the bill in the Central Union case had been filed and after all the stock now held by the American company had been acquired, the court held that this act could not in any event affect the legality of these prior transactions or make valid a holding of stock which before had been invalid and illegal; that the fundamental public policy of the State of Illinois against unregulated monopoly remained unaffected by the passage of this act, but that under the provisions of this set it was a question for the Public Utilties Commission to determine in each case how far there should be regulated monopoly and how far there should be regulated competition and pointed out that this act in no way indicated that the public policy of Illinois would now sanction the creation of a country-wide monopoly such as the Bell system is.

The court held that the complainants in the case suing on behalf of themselves and all other stockholders in the Central Union company similarly situated were entitled to an accounting against the American Telephone & Telegraph Company under a variety of intercorporate contracts or relations between the American Telephone & Telegraph Company and the Central Union.

He commented on the duty of the directors and officers of the Union company to show an undivided loyalty to the Central Union company and its stockholders, and on the fact disclosed in the record that they really regarded the American Telephone & Telegraph Company and not the Central Union as their real master. That the Central Union had thus been prevented from enjoying advantages and profits which it would have had if it had had inde-

pendent officers and directors free from the domination of the American company. He held in short that the American company as majority stockholder had dictated the election of the officials of the Union company and had controlled its officers in all particulars.

The court took up in detail a variety of the intercorporate relations which had existed between the Central Union and the American Telephone & Telegraph Company and held that the accounting should cover several of these relations, such as the division of tolls between the two companies on telephone messages handled jointly over the lines of the two companies. He also ordered an accounting of the transactions under the so-called 100-mile contract entered into in the year 1894 pursuant to which the Central Union had been deprived of the handling of business in its territory between points more than 100 miles apart, the Central Union being required to turn over such business to the American company without regard to whether or not the Union company had existing facilities for handling the same or not.

The court denied the prayer of the complainants for an accounting on account of the purchases made by the Central Union from the Western Electric Company.

ELECTRICAL INSPECTORS DISCUSS MEANS FOR MINIMIZING HAZARDS.

Western Association of Electrical Inspectors Holds Annual Convention at Toledo.

A good idea of the rapidly broadening scope of the electrical inspector's sphere of activity was afforded by the large variety of topics considered at the twelfth annual convention of the Western Association of Electrical Inspectors which was held on January 23 to 25 at Toledo, O. Inspectors and others prominently interested in the reduction of electrical hazards by the betterment of construction gathered in good numbers from all parts of the country and engaged in earnest consideration of vital problems in this field.

The convention opened Tuesday morning with an address of welcome by a representative of the mayor of Toledo, to which E. Anderson of Minneapolis, Minn., replied on behalf of the association. President F. H. Moore in a brief address reviewed the activities of the association and urged more co-operation between inspectors, contractors, manufacturers, architects, etc. Reports were presented by the secretary, treasurer and executive committee.

A. R. Small, vice-president of the Underwriters' Laboratories, made an address on "Industry Conference Standards." What are known as industry conferences have been organized to bring together the manufacturers of various devices, and the staff of the Laboratories to discuss freely how any device should be built to give the best service. The influence of the Laboratories on the manufacturers is in this way increased to keep them from making appliances improperly on account of competition. As the result of these conferences standards are drawn up which give detailed specifications for the respective appliances, thus amplifying the general definitions in the latter part of the National Electrical Code.

Socket Ratings—250 and 660 Watts.

Dana Pierce, vice-president of Underwriters' Laboratories, made an address on "Lamp-Socket Ratings—250 and 660 Watts." The socket is the most used electrical appliance and the one most subject to abuse. Most users, particularly in homes, have not the faintest conception of what socket ratings mean, nor the precautions that should be taken in their use. The general and increasing use of all electrical appliances, especially heating appliances, presents a serious socket problem because of the common and unrestrainable practice of connecting them to the most convenient socket. The use of socket appliances cannot be prohibited. When these are used with keyless sockets, all of which are now rated at 660 watts, the trouble is not so great, but on key and pull-chain sockets a serious hazard arises when the socket switch is used to switch the appliance on and off; consequently these latter sockets have been rated at 250 watts and they should be restricted to loads below this. Although these ratings are arbitrary, they are practical under present conditions.

A partial solution of the problem lies in education of the public. Keyless sockets and wall receptacles should be recommended wherever possible. The ultimate solution will doubtless be raising socket standards, and possibly standardizing the 660-watt rating for all sockets. Specially difficult manufacturing conditions now prevailing would make this inadvisable now. However, there is an undoubted tendency toward production of better sockets.

The subject was discussed by F. D. Varnam, B. Berssenbrugge, F. L. Lucas, R. E. Moran, H. R. Sargent and others. On motion of V. H. Tousley, the association recommended universal use of 660-watt sockets, but without setting any definite time limit.

Wiring of Squirrel-Cage Induction Motor.

On Tuesday afternoon a paper by G. S. Lawler, of Boston, on "The Squirrel-Cage-Type Induction Motor and Its Wiring," was read by F. A. Barron. This paper showed that despite its ruggedness and other desirable qualities, this motor has been the source of much trouble in determining the proper size of feeders on account of its heavy starting current. Much of the confusion has been due to misinterpretation of the requirements of the National Electrical Code. Mr. Lawler's comments served materially to clarify the situation.

The discussion was in the nature of a symposium representing different interests. F. A. Barron, Schnectady, N. Y., said the manufacturers desire merely to have uniformity brought about and will co-operate heartily to this end. H. R. Fowler, Toledo, O., said the contractors seek uniformity in order to estimate on an equal basis.

The report of the committee on "Installation and Operation of Induction Motors" was then presented and the entire subject discussed further by B. Berssenbrugge, R. E. Knox, R. E. Moran, G. Southern, F. A. Barron, V. H. Tousley, F. R. Daniel, H. R. Fowler, E. Anderson and others.

Relation of Feeder Sizes to Connected Load.

A symposium on this subject was opened by O. M. Frykman, Minneapolis, Minn., who said that on account of the high cost of conductors an effort is now made to make the feeders as small as permissible. He felt they should be of ample size because of the very common practice of increasing loads after installation and in order to avoid cost of subsequently running new feeders. G. Southern, Toledo, O., agreed to this but said in many installations where part of the connected load is always idle this should be allowed for by basing the feeder on the actual probable demand. In this case he recommended that circuit-breakers be used instead of fuses. J. J. Duck, Toledo, O., declared that it was not advisable to reduce sizes of feeders because of the almost certain subsequent additional loading of the circuits and especially in residences, stores, schools, etc., as well as in factories.

H. B. Gear, Chicago, stated that in the smaller installations Mr. Duck's suggestions were entirely proper, especially so in residences where every encouragement should be given to growth of load. In large power installations, on the contrary, it was quite common to find feeders installed that greatly exceeded all actual demands. The matter was further discussed by Dana Pierce, F. A. Barron, B. Berssenbrugge and Mr. Gear.

At the Wednesday morning session safety was the principal topic of discussion, particularly as it is being promoted by the National Electrical Safety Code and its enforcement by inspectors. At the afternoon session reports of committees were considered. On Thursday there was a general discussion of miscellaneous inspectors' problems.

PLANS ARRANGED FOR "WIRE-YOUR-HOME TIME."

National Campaign to Be Held April 1 to May 15 Under Auspices of Society for Electrical Development—Many Prizes to Be Offered.

A meeting of the Committee appointed by the Society for Electrical Development to formulate plans for the nation-wide house-wiring campaign to be conducted April 1 to May 15, met in the offices of the Society in New York, on January 18. G. M. Sanborn presided. Others present were: Robert Montgomery; T. J. McManis; Elliot Reid; H. C. Heidrich; M. S. Seelman, Jr.; M. A. Oberlander, representing E. W. Rockafellow; P. B. Zimmerman, representing N. H. Boynton; Mr. McIver, assistant to T. J. McManis; J. M. Wakeman; H. W. Alexander; Hill Griffith; J. T. Kelly; A. J. Edgell and E. M. Hunt.

The meeting was called to order at 10:30 a. m. The chairman informed the Committee that the board of directors of the Society had decided that a house-wiring campaign should be conducted by the Society from April 1 to May 15, 1917.

H. W. Alexander stated that a sales campaign booklet, similar to that of last year in size and general text should be prepared, brought up to date and made more complete, that the Society should issue a broadside announcement of the campaign, to be sent to the entire mailing list, this broadside to tell of the plans, etc. News articles for the trade press should be made ready for mailing just as soon as possible. Advertisements should be prepared and sent out to the trade generally as suggestions for advertising to be used during the campaign in the local newspapers.

J. M. Wakeman explained that instead of preparing a special booklet for distribution to the public, it would be better to use the booklet now being prepared by the Commercial Section of the N. E. L. A. which would be an absolutely new booklet gotten out by the Publications Committee, the price of which would be very low, and which booklets would be ready for distribution in ample time for use in the campaign. The Committee approved these plans.

After a discussion as to the official name for the campaign, it was decided upon "Wire-Your-Home Time, April 1 to May 15." This was unanimously carried.

Window displays were next considered, and inasmuch as these are purchased by the manufacturers and distributed by them to their agents, the chairman appointed a sub-committee to decide upon the window display, the sub-committee consisting of T. J. McManis, chairman, Elliot Reid, P. B. Zimmerman, M. A. Oberlander, A. J. Edgell.

The next subject for discussion was the question of prizes to be awarded in connection with the campaign. It was decided that prizes should go only to members of the Society, therefore only members of the Society or their employees are eligible as contestants.

It was also decided that for the purpose of the contest, a contract must consist of a new contract for at least three rooms, with four sockets or outlets or over, in a home already built. Each contestant must send in his report as to the number of contracts he has closed during the period April 1 to May 15, accompanied by an affidavit to the effect that all contracts listed comply with the above conditions.

A number of suggestions were made and considered as to the plans for awarding the prizes, and it was finally decided that there should be five sections, consisting of cities less than 15,000 inhabitants; over 15,000 and less than 50,000; over 50,000 and less than 100,000; over 100,000 and less than 500,000; and over 500,000. To each of these sections should be awarded a first prize of $150 to go to the individual central station's or contractor's salesman or solicitor closing the largest number of contracts complying with the above conditions, during the period April 1 to May 15, inclusive.

The second prize of $50 will go to the central station's or contractor's salesman or solicitor closing the next largest number of similar contracts in each section, and five of $10 each to the central station's or contractor's salesmen or solicitors obtaining the next five largest contracts.

It was understood that the members of the staff would work out the details and carry out the plans. The members of the staff did not vote, leaving the decisions in the hands of the members of the Society serving upon the Committee.

At the meeting of the sub-committee held immediately after the adjournment of the main Committee ,it was decided that the same window trim would be used as last year, except that a new strip should be printed to run across the top of the window.

CENTRAL-STATION CAMPAIGNS AND OTHER TOPICS DISCUSSED.

Ohio New-Business Men Hold Interesting Meeting in Toledo On January 17.

There were approximately 75 representatives of different electric light and power companies of Ohio in attendance at the convention of the Committee on New Business Co-operation of the Ohio Electric Light Association which was held at the Secor Hotel, in Toledo, O., on January 17, 1917.

The meeting was called to order at 10 o'clock by Chairman J. E. North, commercial manager of the Springfield Light, Heat & Power Company, Springfield, O., who introduced F. R. Coates, president of the Toledo Railway & Light Company, who delivered a very happy address of welcome, in which he referred to the necessity at this time of salesmen giving their attention to the securing of high-rate business because of present operating conditions.

Thomas F. Kelly, commercial manager of the Dayton Power & Light Company, Dayton, O., was then called on to tell of his "Most Successful Campaign in 1916."

The second paper on this same subject was presented by G. A. Lowther, of the Sandusky (O.) Gas & Electric Company.

E. T. Hollingsworth, Newark, O., was then asked to explain some of the activities of the Newark company in 1916 and he referred to the fact that during the year they had made a very interesting house-to-house canvass of their customers to ascertain whether or not the customers had any complaints to offer regarding the service. Mr. Hollingsworth also stated that they were making a particular effort to secure business from people living in wired houses and that this was being done by the salesmen calling in the evening connecting the service temporarily and installing Mazda lamps for demonstration purposes.

C. H. Felker, Columbus (O.) Railway Power & Light Company, then told of two interesting campaigns that had been conducted in Columbus—one being an iron campaign and the other a vacuum-cleaner campaign.

Under the caption of "Our Plans for 1917" talks were given by G. H. Mau, Coshocton; A. K. Young, new-business manager, Toledo Railways & Light Company, and C. E. Yacoll, Mahoning-Shenango Railway & Light Company of Youngstown, in which very many interesting matters were discussed.

The following information was obtained by inquiry of those present:

Youngstown—110,000 population, 13,000 meter customers, 2,839 appliances sold in 1916.

Springfield—55,000 population, 7,000 meter customers, 1,700 appliances sold in 1916.

Toledo—210,000 population, 37,000 meters, 12,000 appliances sold in 1916.

Sandusky—25,000 population, 2,500 meters, 83 per cent of the residence customers are using electric irons.

Upon inquiry being made of those present, it was found that in practically every community represented by the delegates, lamps were being sold at list prices.

A. K. Young in his talk on the plans in Toledo for 1917

stated they expected to sell at least $12,000 worth of merchandise each and every month and that plans were prepared covering the conducting of campaigns throughout the year as follows: February, washing machine; March, vacuum cleaner; April, house wiring; May, electric iron; June, washing machine; July, vacuum cleaner and electric fan; August, electric toaster, iron and percolator; September, electric sign and house wiring; October, electric vacuum cleaner; November, piano and table lamps.

E. R. Kelsey, advertising manager of the Toledo Railways & Light Company, gave a short but interesting talk on how the advertising department should co-operate with the sales department.

The delegates adjourned at the noon-hour and had luncheon together in one of the dining rooms of the Secor Hotel.

The afternoon session was opened by C. E. Yacoll, of the Mahoning-Shenango Railway & Light Company, and a member of the Committee on Education of Salesmen of the Commercial Section, National Electric Light Association, explaining the educational courses that were now available for employees of member companies of the National Electric Light Association.

Frank B. Steele, power engineer of the Dayton Power & Light Company, explained what progress had been made in the Dayton company regarding the two courses referred to by Mr. Yacoll, namely, the Commercial Engineering Course and the Course on Practical Electricity.

Messrs. Crippen and Wert of the Mahoning-Shenango Railway & Light Company, elaborated on what progress had been made regarding these courses in Youngstown.

Frank Wert, of the Mahoning-Shenango Railway & Light Company, then presented a very interesting paper entitled "Is the Customer Always Right?"

The afternoon program concluded with a very interesting talk by H. J. Kunz, of the Toledo Railways & Light Company, on "Electric Heating," following which the delegates were taken in a special car to the Willys-Overland automobile plant where the electric heating installations were inspected.

ANNUAL MEETING OF MISSOURI CONTRACTORS HELD.

State Problems Discussed and New Officers Elected at Sixteenth Annual Convention in Kansas City.

The Electrical Contractors of the State of Missouri held their sixteenth annual meeting at the Sexton Hotel, Kansas City, January 20, with Fred B. Adam, of St. Louis, president, in the chair.

C. A. Spaulding, of Kansas City, talked on the relations between the Jovians and the electrical contractors, suggesting co-operation on sound laws as one of the points of contact, and the benefits that come from close personal acquaintance as another.

Pierre R. Porter, an attorney, talked on the proposed workmen's compensation law in Missouri. As a result of his address, a committee was appointed to work in behalf of a substitute, already offered, to the bill now before the general assembly. Many business organizations of Kansas City and the rest of the state are supporting the substitute.

A. P. Denton, in a paper on the chartering of state and local associations by the national association, declared in favor of such chartering, mentioning especially the advantages of the building up of the national through the locals, and the stimulation of the locals to broader activity, from the national.

A paper by Charles A. Pierson, of Kansas City, was read, on the subject, "Is a Retail Department Profitable to the Electrical Contractor?" Mr. Pierson took the position that a retail department naturally belongs to a contractor's business, and that it would therefore be profitable if conditions were favorable—if there is co-operation from all factors in the industry in his locality. He said that good display windows, careful attention to salesmanship, and watching for opportunities to inject the subject of retail goods, are sure to bring profitable results. But a retail department cannot be successful if there is nobody in the establishment who can approach the customer as a salesman.

There was much discussion of the advisability of securing a law in the state governing electrical construction. Some contractors feared conflict with city inspectors. Most, however, agreed that a state law would probably be based on national standards and would help to maintain standards in cities, being especially useful with reference to suburban construction.

The convention took steps towards a general effort to get architects to specify the better construction in their plans. The subject was brought up by President Adam, who referred to the Safety Code of the Bureau of Standards, which he suggested that every contractor should get and read.

"Some contractors may thoughtlessly say, sometimes, in connection with an especially high-standard installation, 'Don't spend money on that!'" said Mr. Adam. "They are the kind that pull down the industry. The majority of us are trying to build up, and urging the better installation, regardless of the cost." The sessions closed with a banquet. The following officers were re-elected:

President, Fred B. Adam, St. Louis.
First vice-president, William Koenemann, St. Louis.
Second vice-president, Robert Baker, Kansas City.
Secretary, A. J. Burns, Kansas City.
Treasurer, E. H. Heath, Kansas City.
Director, L. E. Reid, St. Joseph.
State director, A. Penn Denton, Kansas City.

IMPORTANCE OF GOOD STORE LIGHTING AND METHODS OF OBTAINING IT.

Illustrated Lecture on Store Lighting Delivered Before Chicago Section, Illuminating Engineering Society.

The first presentation of the lecture on "Store Lighting," prepared under the auspices of the Illuminating Engineering Society, was made before the Chicago Section of the Society on January 19, the lecturer being A. L. Powell, of Harrison, N. J., chairman of the committee in charge of preparing the lecture. It is proposed to give this lecture before any organizations of merchants, lighting men and others interested in better lighting of stores, consequently the lecture is of a popular character, but full of authentic technical facts on the subject.

The primary objects of store lighting are to display the goods being sold and afford proper light for clerks and customers to move about and transact their business. A secondary object is to make the store attractive and thereby draw patronage. The effect of poor lighting is depressing on both clerks and customers which not only decreases the number of sales, but causes irritation and many mistakes. Mr. Powell set forth the requirements of both daylight and artificial lighting of stores, showing that the actual intensity of illumination depends chiefly on the nature of the goods sold, as well as the color of the ceilings, walls, etc. In some ten per cent of stores color matching, chiefly of textiles, is an important consideration. For this purpose special color-matching equipment should be provided.

Mr. Powell pointed out the great importance of avoiding glare, both in the selection and arrangement of the lighting equipment. Light sources of very limited area, such as bare filaments or gas mantles, and exposed lamps in general, produce most objectionable glare which results in decided discomfort as well as reduction of the ability to see. The high efficiency obtainable with modern illuminants certainly permits of utilizing part of it to secure proper diffusion of the light.

In the average small store efficiency and low cost of equipment are of prime importance and it is seldom possible to

give artistic effect very great consideration. Direct lighting will therefore be used in most cases. The kind of fixtures to be used and their location will depend on the character and shape of the store principally. Proper reflectors should be carefully selected and installed.

In department stores both artistic effect and efficiency are, as a rule, of equal importance. Special consideration should be given to attractive lighting of the main floor and this should have a higher intensity than the other floors. Uniformity of illumination is usually quite desirable, at least throughout an entire department and preferably throughout each floor; the lighting equipment likewise should be harmonious throughout the entire establishment. Certain departments, however, require special lighting; the art department can be best lighted by proper mirrored-glass reflector troughs placed so as to throw the light on the pictures; rug racks can be well lighted by means of steel reflectors; for the cut-glass department it has been found that direct lighting gives a pleasing sparkle to the glass displayed. Careful attention must be given to frequent cleaning and other proper maintenance of the entire equipment.

The desirability of lighting the exterior of the store was also touched on, this being for the purpose of attracting patronage from a distance of a block or more. Formerly such exterior lighting was chiefly by means of arc-lamp brackets and incandescent outline lighting. The modern way is to do this by flood lighting wherever possible.

The lecture was discussed by A. J. Sweet, F. H. Bernhard, J. R. Cravath, W. A. Durgin, M. G. Lloyd, F. A. Vaughn, chairman, Otis L. Johnson and Mr. Powell.

GROUNDING OF SECONDARIES DISCUSSED BY INSPECTORS.

Winter Meeting of the New England Section, National Association of Electrical Inspectors.

The fifteenth regular meeting of the New England Section, National Association of Electrical Inspectors, was held in the City Hall, Northampton, Mass., on January 10, and was called to order at 10 o'clock by President A. W. Hopkins, of Springfield. The routine business was put through rapidly. The report of the treasurer showed the Section to be in a prosperous condition, and that of the secretary showed a gain of membership so that at the close of the meeting the membership stood at 35. The election of officers for the ensuing year resulted in the election of L. N. Heebner, of South Manchester, Conn., as president; M. H. Mahoney, of Turners Falls, Mass., as vice-president; R. J. Forsyth, of Greenfield, Mass., as secretary-treasurer. The Executive Committee was elected as follows: P. O. Neumann, of Holyoke, chairman, Joseph P. Rohan, Hartford, Conn., A. H. Hopkins, Springfield, Mass., W. A. Perkins, Middletown, Conn., Thomas H. Day, Hartford, Conn., members. Delegates to the Executive Committee National Association for two years: W. F. Francis, of Pittsfield, Mass., and L. N. Heebner.

The business session was closed at eleven o'clock and the Section adjourned to the Auditorium of the City Hall where about 70 invited guests were waiting. Retiring President Hopkins made a brief address and introduced the mayor of Northampton, A. J. Morse, who welcomed the Section and its guests to the city in a very delightful way. The reply was made by Past President Day after which Alfred E. Braddell, of New York, took the chair at the request of Mr. Day to preside over the morning session. Mr. Braddell, now of the Sprague Electric Works, was one of the earliest members of the fraternity of electrical inspectors, being employed by the Middle Department and covering New Jersey, Pennsylvania, Maryland, Delaware and the District of Columbia. He was a member of the original small committee which in 1895 originated the present National Electrical Code. Mr. Braddell referred in a delightfully reminiscent way to the early days of inspection work. He then introduced W. J. Canada, of the Bureau of Standards, Washington, D. C., who presented a most instructive paper on the National Electrical Safety Code. Mr. Canada's paper was followed by a prolonged and interesting discussion in which 21 persons took part. At the close of this the meeting adjourned for dinner at the Plymouth Inn.

The afternoon session was called to order at half past two by the new president, Mr. Heebner, there being 97 in attendance.

Mr. Heebner introduced W. K. Touhey, of Springfield, first vice-president of the National Electrical Contractors' Association, to preside over the afternoon forum on the "Grounding of Alternating-Current Secondary Distributing Systems."

This was preceded by a paper on the subject by William H. Blood, Jr., of Boston, insurance expert for the National Electric Light Association. He stated that his interest in the subject was aroused first over 20 years ago by a shock received by his little daughter in the bathroom of his own house. He traced the original idea of absolute insulation of the house wiring, through the stages of "permissive grounding," preferable grounding (Code of 1903) and required grounding (Code of 1913) and spoke of the matters of tree grounds, crosses, broken transformers, oil loss, lighting, etc. He brought out the fact of the four interested parties, the general public which must be protected, the supply company, the water company and the underwriters.

According to Mr. Blood, the supply company that does not ground its lines is simply wasting money, for it can easily, under present court decisions, lose $5,000 or $10,000 in case of accident (as non-grounding is simply and purely setting a trap for the unsuspecting public) which would pay for a very considerable amount of overhauling and grounding of circuits.

The objections of water companies rises from the fact that the managers do not realize that grounding on their pipes means as near absolute safety in the domestic use of electricity as it is humanly possible to reach. That the fear of electrolysis is due to past difficulties with improperly arranged direct-current railway systems; that alternating current causes no electrolysis; and further that there is no flow on the ground wire of a secondary alternating-current system under normal conditions, while if it does come the circuit is blown and the flow cut off in an instant, were brought out by Mr. Blood.

He showed the growth of sentiment among the Underwriters and explained the methods of the best supply companies, which enjoyed the highest grade of engineering talent, such as the Commonwealth Edison Company of Chicago, with 500 square miles of territory, the Consolidated Gas, Electric Light & Power Company of Baltimore, the Brooklyn Edison Company, the New York Edison Company, the Edison Electric Illuminating Company, of Boston (with the exception of one town with a privately owned water system, where it is not allowed and in which case other means have to be used with results of ground resistances varying at times from 400 to 3,000 ohms), and others. He read a letter from Commissioner Cole, of Boston, in which it was stated after 10 years of experience, that each alternating-current overhead service was grounded on the piping, that it was considered as absolutely imperative to safety to life and that experience had shown it was attended with absolutely no risk to the piping.

His talk was followed by a most animated discussion, many questions being asked by the guests present who represented contractors, municipalities, water departments and others interested, all of which were answered in a convincing way.

There were representatives of some of these interested parties from every one of the New England states.

The meeting finally closed with a vote of thanks to all who had assisted in making it one of the most valuable in the history of the Section or indeed of the National Association. The Section voted to meet again in April at Holyoke, Mass.

The Eastern Massachusetts Section omitted its January meeting and this meeting of the Western Section was attended by over a third of its members.

Miscellaneous NEWS NOTES

Demand for Telephones in Japan.—It is estimated that there are 150,000 persons and firms in Japan awaiting the installation of telephones on their premises, the government being unable to keep abreast of the demand for appliances.

Bill to Abolish Minimum Service Charge.—A bill providing for abolition of the practice of public service companies of collecting a minimum service charge will be introduced in the Indiana Legislature by Senator M. C. Thornton. The measure would apply to electric, gas or water companies, and meter readings would govern charges.

Birthday Dinner to Thomas Edison.—Arrangements have been perfected by employees of Thomas A. Edison, Inc., West Orange, N. J., for a banquet and entertainment on February 11 to Mr. Edison, in honor of his seventieth birthday, occurring on this date. The event will take place on the third floor of the plant devoted to the manufacture of storage batteries, and it is anticipated that about 1,500 employees will be present.

Jovians Meet at Kansas City.—The annual convention and banquet of the Statesmen and Congressmen of the Jovian Order of the section, including Missouri, Kansas, Iowa and Nebraska, was held in Kansas City recently. Tentative plans were made for the furtherment of the organization in the territory, but nothing permanent was done on these plans, as they were merely discussed and will await further development before being acted upon.

Bill to Avoid Delays in Rendering Rate Decisions.—A committee of investigation of lighting and power rates and service in Leonimster, Mass., has requested its consulting engineer, Alton D. Adams, of Boston, to frame a bill which will be presented to the 1917 Legislature, providing that reductions ordered by the Gas and Electric Light Commission shall go into effect at the time the petition is filed rather than subsequent to the decision. The committee claims that delays in rendering decisions will be shortened or their effect neutralized by such a law.

Kansas City Company Increases Capital Stock.—The Public Service Commission of Missouri has authorized the Kansas City Electric Light Company to increase its capital stock to $4,979,000, or about one-half of the value of the company's actual investment in its plant. It was stated by officials of the company that the action of the commission gives the company a basis on which to regulate its charges for electricity for light and power and that it is contemplated shortly to reduce the rates for residence service from 10 cents a kilowatt-hour to seven cents.

Conservation of Water Power in Maine.—A bill has been entered in the Maine Legislature looking to the conservation of the water-power resources of the state. The Public Utilities Commission is instructed to determine and report on all water power rights owned by the state, and the possibility and cost of their development. It is also instructed to continue the work of the Water Storage Commission and report, looking up riparian rights that may be needed by the state in the future. A total of $10,000, for use in the next two years, would be appropriated for the work.

Report on Columbia River Power.—The printed report of the board of review appointed by the Secretary of the Interior Franklin K. Lane to consider the feasibility of the Columbia River power project near the Dalles is being circulated. From this report, it appears that there is no present commercial demand which at possible price of power could justify the immediate development of the project. The board also stated that it could not see any prospect for such demand in the near future. It is estimated that the project may be completed to the point contemplated for a sum, including interest at six per cent during construction, of approximately $55,000,000.

West Virginia Telephone Company Merger.—The Consolidated Telephone Company, operating in the northern part of West Virginia; the West Virginia Central District Company, and the Chesapeake & Potomac Telephone Company, have been merged into one company to be known as the Chesapeake & Potomac Telephone Company of West Virginia. Principal offices will be maintained at Charleston.

Engineers Not Entitled to Extra Compensation for Operating Electric Generators.—The Anthracite Conciliation Board, Hazelton, Pa., has issued a ruling, through its umpire, Charles P. O'Neill, against the contention of hoisting engineers operating at the Minersville plant of the Buck Run Coal Company for additional compensation where they are compelled to operate or look after electric generators in connection with their regular duties. The Board says that there is nothing to show that the sole function of such engineers is to attend to hoisting work.

Recent Steps to Overcome Electrolysis.—The electrolysis survey of the city of Omaha, Neb., by the Bureau of Standards was completed a few weeks ago and a report is being prepared to show the measures that must be taken to remove the difficulty. The Bureau acknowledges valuable co-operation on the part of the various utilities involved in this work, which promises to have especially important results. The engineers of the Bureau of Standards are also examining the installation at Springfield, Mass., to see how nearly the results agree with predictions made from the design of their system. If everything is satisfactory, the same system will be installed throughout a large part of the city of Springfield. The experimental station is in West Springfield, and the work is attracting considerable attention from electrical engineers in other cities.

Springfield Engineers' Club Elects Officers.—The Springfield (Ill.) Engineers' Club installed the following officers for the ensuing year at its regular meeting, January 15: President, B. H. Peck, Public Utilities Commission; first vice-president, B. G. Campbell, Springfield Gas & Electric Company; second vice-president, F. R. Atwood, Central Union Telephone Company; recording secretary, J. R. Hughes, Public Utilities Commission; corresponding secretary, Curtis Prout, Illinois Traction System; treasurer, C. A. Crytser, Springfield Gas & Electric Company. The club has a membership of 130 engineers connected with the industries and state departments, especially the Central Union Telephone Company, Springfield Gas & Electric Company, Illinois Traction System, Sangamon Electric Company, State Highway Department, State Board of Health and State Public Utilities Commission.

Philadelphia Electric Company Merger Approved.—The Pennsylvania Public Service Commission has approved the merger of 14 electric companies, including the Pennsylvania Light, Heat & Power Company, into the Philadelphia Electric Company. The Philadelphia company agrees that the attendant cost will be carried entirely by its stockholders and will in no way affect consumers. This merger will allow the company to proceed with its plans for financial adjustment, extending its credit from $57,000,000 to $110,000,000, through an increase in stock and bonded capitalization, and will also permit the carrying out of proposed work to extend the facilities for generating and distributing electric energy for light and power service. In its formal notice that the merger was approved, the Commission's office says: "The Public Service Commission has approved the application of 14 companies to transfer their properties to the Philadelphia Electric Company, all of these companies being located and doing business in Philadelphia, making the administrative and executive management of these 14 companies under one head."

Effect of Local Conditions on Utilities

An Important Compilation of Facts and Factors of Commonwealth Edison Service in Chicago Which Demonstrates the Effect of Local Conditions on Public Utility Service and Which Apply to Smaller Cities, as Well—From a Paper Before the Indiana Engineering Society

By PETER JUNKERSFELD
Assistant to Vice-President, Commonwealth Edison Company.

A SERVICE that can be better performed in a centralized manner than by the individuals or even by small groups of individuals is usually termed public-utility service. The most common forms of such service are water, gas, telephone, electric light, power and urban transportation. Some of these were originally limited to one village, town or city.

Assuming that the part played by telephone management and employees remains constant, the quality of telephone service will improve or deteriorate in the same proportion as the telephone habits of the community improves or deteriorates. Under such conditions the telephone service is just what the telephone users make it, no better and no worse. And yet how rarely is this matter understood or appreciated.

In practice it is usually necessary and desirable for the telephone management not to remain constant, but to prevent the telephone habits of users from becoming worse because it means increased expenses or reduced revenue or both. This is done in various ways by publicity, by limiting or occasionally interrupting long conversations, or sometimes by telephone rates based on measured service. The latter method is nearly always employed for long-distance telephoning when the amount of line equipment held by the user is very costly.

In order to reduce both investment and operating costs it is necessary to popularize service to have enough subscribers to allow economical operation. Much depends, however, also on whether these subscribers are located say, five in a city block, or 50, in the same size block. In other words, the first cost to connect for service depends largely on density of subscribers. This again is largely a matter of habit whether most householders or only a very few are telephone subscribers.

The influence of density of business is, however, more marked in other utilities, particularly water, gas, electricity, urban, interurban and trunk-line railroads. It is also true but to a much lesser extent of other lines of business, manufacturing, merchandising, banking and others.

Relative Investment for Three Different Electric Service Customers.

In general, the larger the capital invested in proportion to the annual revenue the more important the matter of density. For instance, the capital invested in the public utilities mentioned above is turned over about once in say from four to six years. The capital in most manufacturing is turned over perhaps once a year, that in merchandising perhaps two or three times a year. The slower the turnover the more important it is to make every dollar invested serve as many customers as possible in order to prevent the turnover from being still slower.

As a definite example of effect of density or public utility service I will point out some differences in cost to supply electric service under different conditions in Chicago and which differences will also apply in a greater or lesser degree to smaller cities.

In Table 1, column "A" shows approximately the relative investment required to supply electrical energy untransformed at a large substation; column "B" that to render complete electric service to one of five residence customers in a block, and column "C" that to render the same service to one of 50 residence customers in a block.

TABLE 1.

	"A"	"B"	"C"
Generating station	12.3%	12.3%	12.3%
Transmission system	3.2%	3.2%	3.2%
Substations	.....	4.4%	4.4%
Distribution to block in which home is located	.....	9.3%	9.3%
Distribution within such block	.....	58.6%	12.0%
Meters	.....	9.0%	9.0%
Lamps	.....	3.2%	3.2%
	15.5%	100 %	53.4%

If for simplicity of illustrations we assume (a) that the electric utility has only two classes of customers and (b) that the yearly load-factor of each customer in the two classes is the same, and (c) that the same yearly fixed charge could be applied to the entire investment used for each customer, then the investment charges for the consumer of untransformed energy would be only 15.5 per cent of that for the residence customer who is one of five customers in a block.

In column "B" are shown the relative investment costs of the man who is one of only five small residence customers in a block. If there are 50 similar small customers in a block, as in the case of large flat buildings, the total investment charges as shown in column "C" are reduced almost one-half.

The reason for this large reduction is, that for mechanical reasons the poles, the primary wires and the secondary wires necessary for five customers to the block, are also sufficient to supply 50 customers to the block. The only addition in investment for 50 customers instead of five customers in a block is the larger transformer and the additional number of service drops. If every block in a city or in an area served for 50 or more customers, there would be a considerable reduction also in the items of transmission or substations, and of distribution to the boundary of the block. The above, together with the table illustrates the very great influence of density of investment required to render electric service to homes. It also shows that the investment per unit of demand is six or seven times as great for the small customer in column "B" as the larger customer in column "A." The interest and other fixed charges in this investment must be paid from month to month and year to year. The interest and other fixed charges go on and on and must be paid when the customer uses the service only five minutes per day as well as when he uses it five hours per day. This is one of the reasons why a minimum bill each month is equitable and fair. Again the cost to supply electric service depends on local conditions and habits. If every householder in a block takes electric service instead of only a few in the block the cost will be less and hence finally the rate will be less and all share the benefit.

Relative Expenses Other Than Investment Charges.

All of the expenses per kilowatt-hour (other than fixed charges on investment) incurred in supplying electrical energy untransformed are only about six or seven per cent of those incurred in rendering electric service to a very small customer (five customers to the block). The reason

for this is that in case of untransformed energy in bulk the only large expenses are those in operating and maintaining the generating station and the transmission lines. All of the other expenses such as the cost of reading and maintaining meters and rendering and collecting of bills for such large customers are relatively small items.

In the case of the very small customer that we are considering the operating and maintenance expenses in connection with the substation and complete distribution system, meters and lamps and often free repairs for customers are a very large item. The general expense incurred in reading, testing and maintaining meters, rendering and collecting bills and keeping and carrying the account is just as great for the smallest customer as for a moderate-size customer. Here then is another reason why a proper minimum bill is necessary to prevent injustice and it therefore is equitable.

Metering and Billing Methods.

The cost each month of reading the meter, entering on the books, rendering the bill and making the collection, is about 16 cents per bill. This is repeated 12 times a year. This 16 cents is a very large proportion of a bill for electric service that is often $1 or less per month. Here is another important problem. If such bills could be rendered quarterly and collected without prohibitive loss the saving would be considerable and of which saving the customer would ultimately receive the benefit.

One great psychological difficulty with present methods is that most residence customers look on electric-light bills as monthly transactions because the bills vary from month to month. If a fixed amount could be billed and collected, say quarterly or monthly in advance and the excess or deficiency adjusted after reading the meter annually or semi-annually, it would result in a very great saving which would ultimately benefit all the customers. The possibilities of simplified methods in metering, billing and collecting and hence of relations with customers are very great and the necessity for such simplifications is becoming more urgent year by year.

Increasing the Output.

We have been considering two extreme cases, one very large and one very small customer for illustration. The investment cost per kilowatt-hour of demand was, you will recall, nearly seven times as great for such residence customers, and all other costs per kilowatt-hour about 15 times as great for such residence customers as for the street railway. A large proportion of the business of an electric utility, however, lies between these two extremes. It is a very difficult matter to determine accurately the relative cost to supply each of the many different customers under widely varying conditions of service between the two limits considered above. It is, however, necessary to keep the matter of cost constantly in mind because any customers that are served below cost to render service involve a loss that must eventually be borne by the other customers. It is one of the present problems and duties of every electric utility and of the commission having jurisdiction to see that the number of customers served below cost shall not become too large and thus prevent an injustice to all other customers.

Even if it were possible, it is, however, not at all necessary that all customers should afford the same percentage of profit. In a great many instances it is necessary in order to secure additional customers that they be served at a lower margin of profit than is afforded by some existing customers. Every customer added to the utility if he affords any profits at all is a source of benefit to all of the other customers provided always, however, that there should be no discrimination in rates under like conditions of service. Take for example, the electric-railway business in Chicago. During the first two or three years this railway business was served at practically no profit. The demonstration was, however, successful and as a result the sale of electrical energy to the railways increased rapidly and soon afforded a reasonable profit. Since then this railway business has made possible the very large and economical power houses and transmission systems from which all of the other customers have since received very large benefits, as demonstrated by the many reductions in rates. In this respect the sale of electrical energy is not essentially different from the sale of the output of a manufacturer who makes a moderate profit on his regular line. In order, however, to run his factory more economically it is advisable for him to take on an additional line and if possible a line that can be manufactured during the particular season of the year when the demand for his regular product is at a minimum. When first taking on the additional line he is entirely justified in doing so at a low margin of profit or no profit at all, and by so doing increase the quantity of his entire production so much that he is finally able to cut down the margin of profit both on the standard line and on the additional line, thus benefiting both his old and new customers.

The fixed charges on investment, interest, depreciation and the like, are the largest portion of the cost to serve the majority of users of electric service. The matter of load-factor is therefore of vital importance, that is, if a dollar invested in the electric utility can be made to work twice as many hours per day the fixed charges are correspondingly reduced. This is what happens if the same equipment can be used to supply the peak of one or a set of customers during the early hours of the day and another set of customers during the evening and night hours with no overlapping of the two peak demands. Most manufacturers have their peak load at about 10 o'clock in the morning. The business and residence lighting peak comes in the late afternoon or evening. This so-called diversity of demand is one of the fundamental and important economic reason for massing of electricity production on a large scale.

Attitude of Public to Electric Service in the Home.

But let us again return to the residence service portion of the business. After all that is the portion that is most conspicuous to the general public. That is the portion of the business that affects even though to a small extent, the pocketbook, of say one-third or more of the voters of a city and eventually of nearly all the voters.

The average residence customer is unconscious of the fact that he is using more and more electricity, as is indicated in Table 2.

TABLE 2.—INCREASED USE OF ELECTRICITY IN APARTMENT AND HOUSES.

October, 1908—October, 1916, Inclusive.

	No. of Customers	Average Kilowatt-Hours Per Customer
October, 1908	25,900	15.6
October, 1909	37,940	16.6
October, 1910	51,760	18.5
October, 1911	67,806	18.0
October, 1912	86,462	21.0
October, 1913	110,649	24.2
October, 1914	126,000	22.5
October, 1915	141,620	22.9
October, 1916	168,234	23.8

This table is the result of a very careful analysis of the bills of all residence customers for each October from 1908 to 1916, inclusive. The month of October was selected as this is believed to represent nearer than any other month about one-twelfth of the annual use by residence customers.

A part of this increased use of electricity in homes is undoubtedly due to use of household appliances. These are rapidly becoming more popular. Their use lessens the burden of housework very greatly and saves women's health and strength. Electricity is thus utilized to fill a

real economic need to the individual and to the nation. The possibilities for further use of appliances are very great. In their homes people want conveniences and light.

The great portion of refinements in service are occasioned by the residence customers. They are in the majority. In the last analysis they are ultimately in control. In many cities the residence users pay only a small proportion of the revenue of the electric utility. In one large city the proportion of revenue is as follows:

Residence Customers	18%
Commercial Lighting	36%
Commercial Power	23%
Railway Power	23%

As a general rule the smaller the city or town the larger the proportion of total revenue that comes from residence users. Obviously if there is no manufacturing in the city or town and if no power is furnished for street railways the residence portion of the utility's revenue is necessarily much larger.

The residence rather than the commercial customers are hardest to please. They want the lowest possible rates and the best possible service. They are unquestionably entitled to both if not carried to a point where it is against their best ultimate interest. If, for instance, residence rates are forced so low and quality of service forced so high that substantially all residence customers were served at a loss, the commercial and industrial customers might temporarily bear the extra burden. A part of the cost of the electric service for residences would then appear in increased price of provisions, clothing, amusement and so on. Furthermore, this extra burden would mean that some industrial and commercial customers might then install independent plants and the electric utility would certainly not be able to get so many new wholesale customers. This would mean less revenue, less profits and certainly less chance for reduction in retail rates, if not an increase in retail rates. In a considerable number of instances state public utilities commissions have found it necessary under such circumstances to raise retail rates. In those cases the forcing of retail rates too low and of service too high has been directly against the best interest of the residence customers and of the community whose credit standing and integrity have thereby been impaired.

In many cases state commissions have encouraged and even directed the electric utility to lower its wholesale rates with a view of increasing the volume of its business, and by this means finally to get into a position where it would be possible to reduce retail rates.

In communities where there is no manufacturing or street railways or where the electrical energy for such purposes is secured from some other source the cost of electric service to residence users must eventually be higher because no use can be made of expensive generating and other equipment except during lighting hours. It is, therefore, for the best interest of every retail user and of every other user of electric service that additional customers be secured by the electric utility. This is true, first, from the standpoint of increasing the density of customers and thus converting unprofitable blocks into more profitable blocks, and second from the standpoint of additional income from any other customer served at a profit.

The supplying of all utility service needed for every purpose in any community or area from a single utility organization, in other words a natural monopoly properly regulated has been demonstrated again and again as being the correct economic solution. Every thinking person knows that two telephone systems, two gas systems, two electric service systems or any other two public utilities in a single community, where one system will answer means needless duplication of equipment at great expense and which is ultimately paid by the public in one form or another. The greatest single problem remaining is the promulgation of mutual confidence and understanding. Engineers, business men and educators are capable of carefully analyzing conditions, problems and possibilities. They can do much for their respective communities. Is it then not their duty to analyze, to understand and to take a firm position in favor of what is right and sound from a broad economic standpoint?

Southwestern Convention to Be Held in Dallas.

At a recent meeting of directors of the Southwestern Electrical and Gas Association, held in Dallas, Texas, for the purpose of considering plans for holding the third annual convention of the association, it was decided that the convention shall be held in Dallas, on April 26, 27 and 28. It is the purpose of the directors, as stated at the meeting, to prepare a splendid program for the occasion and to make the convention an educational one in all respects. The subjects to be treated and discussed will embrace pertinent problems in the various fields embraced by the membership.

The meeting was attended by the following directors: R. J. Irbine, vice-president and general manager of the San Angleo Electric Company; O. K. Shannon, general manager of the Fort Worth Gas Company; J. W. Carpenter, general manager Corsicana Gas & Electric Company; F. S. Fletcher, assistant general manager Texas Power & Light Company; J. C. Kennedy, general manager Brenham Compress & Oil Manufacturing Company; R. Meriwether, superintendent of the Dallas street car lines; George H. Clifford, general manager North Texas Traction Company; W. A. Sullivan, vice-president and general manager Shreveport Railway Company; D. A. Hedarty, president Texas Gas & Electric Company; David Daly, general manager Houston Electric Company, and H. C. Morris, vice-president and general manager Dallas Gas Company.

Illinois Electric Railways Association Holds Annual Meeting.

At the annual meeting of the Illinois Electric Railways Association, held January 19, in Chicago, the following papers were presented: "The Effect of Low Voltage on Railway Motors," by G. M. Woods, of the Westinghouse Electric & Manufacturing Company; "Headlights," by K. W. Mackall, of the Ohio Brass Company; "How Trainmen Are Developed Into Motormen on the Chicago Elevated Railroads," by M. J. Feron, general superintendent. A. P. Jenks, of the General Electric Company, exhibited a motion-picture film entitled "King of the Rails," showing the electric locomotive construction and the electrification of the Chicago, Milwaukee & St. Paul Railroad.

Officers were elected for the ensuing year, C. F. Handshy being chosen president; D. E. Persons, first vice-president; Frank J. Baker, second vice-president, and W. V. Griffin, re-elected secretary-treasurer.

Cleveland Section, A. I. E. E. Discusses Telephone Problems.

The American Institute of Electrical Engineers, Cleveland Section, held its regular monthly meeting on January 15 in the Electrical League Rooms at the Hotel Statler. The session was devoted to a discussion of telephony and Norman Anderson, traffic superintendent of the Cleveland Telephone Company, discussed the construction and operation of America's great talking service—the Bell System.

About 60 members of the Cleveland Section were in attendance and an interesting discussion followed the telephone talk.

Electricity in Electrotyping Plants

A Discussion of Various Processes Involved in Engraving and Electrotyping With Data on the Application of Electric Motors and Central-Station Service and a Detailed Account of the Installation in a Typical Chicago Plant

Industrial Power Series—Article No. 189

OWING to the magnitude of the printing business at the present time the electrotyping industry has assumed large proportions. Plants devoted to this purpose are generally located in the business section of the larger cities, on one or more floors of an office or loft building where electric motor drive and central-station service are particularly applicable. Both group and individual drive are adapted to this class of work and either induction motors or direct-current motors may be used to advantage. The individual power requirements of the machines are small, but as the work performed by the various machines is intermittent in character, the individual drive is more desirable.

Details of Process.

The object of electrotyping is the production of an exact facsimile of any object having an irregular surface, whether it be an engraved steel or copper plate, a wood cut, or a form of set-up matter to be used for printing. In all cases a reversed mold of the object is first obtained and upon this the copper is electrolytically deposited to a sufficient thickness. Metal deposited on an uneven surface, then removed from it, exhibits a perfect reverse reproduction of every irregularity or line upon its surface. For molding, any material may be used which is capable of taking accurate impressions of an object, and which is not so brittle nor so soft at ordinary temperatures as to be broken or bent out of shape during subsequent processes. The principal materials used are guttapercha, beeswax, plaster of Paris, fusible metal, gelatin, sealing wax, or a composition of materials.

Steel plates carefully engraved are valuable, and as they are slowly worn away by use in the presses, numerous electrotypes of the original are generally made for the actual printing. A mold of the plate is made and the former is rendered conductive on its surface. The mold is suspended as the cathode in the acid-copper bath until a sufficient thickness of metal has been deposited to fulfill the requirements of the original plate. Metallic matrices are sometimes used, and in making these from valuable steel plates it is safer not to take the risk of spoiling them by suspending them even once in an alkaline copper bath on account of the lines losing their sharpness. This may be avoided by the expedient of taking a silver matrix from the plate by electro-deposition and then detaching the silver and depositing copper upon it so as to form a reproduction of the original plate. From the latter a second matrix of copper may be obtained.

Whenever a copper plate is to be electrotyped with the same

General View in a Typical Engraving Plant Using Individual-Motor Drive.—The Absence of Belting and Shafting is Notable.

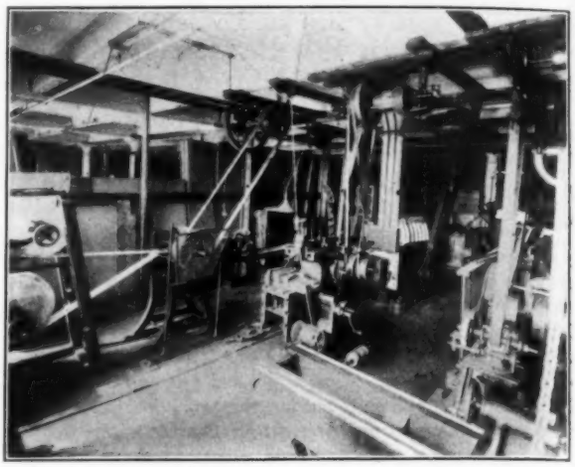
material, care must be taken to prevent adhesion between the two surfaces, the process being the reverse of that of covering one metal with a firm coating of another. A film of foreign matter must be interposed, sufficient to prevent adhesion without so far impairing the electrical conductivity of the surface that it refuses to receive any deposit. This may be accomplished by applying a very thin coating of silver to the surface by a momentary immersion in a silver bath. The silver surface is then treated with a small quantity of water containing a sufficient amount of tincture of iodine to give it a pale cherry color, and then rubbing it lightly with a cloth, or cotton wool, until a scarcely visible film of silver iodide is formed on the surface.

Having prepared the plate to receive the deposit upon its surface, the back must be well painted with water-resisting and nonconducting varnish so that there will be no tendency to deposit where it is not required. The plate is now ready for the bath, and must be gripped by some metal support which will serve to suspend it from the cross-rods of the bath and thus establish electrical connection with the plating generator. Rings or bent wires may be soldered lightly to the back before applying the insulating varnish.

With metallic plates of known area, most of which are of the same size, the plates in any bath, or the baths themselves, may be connected in either parallel or series, depending upon the strength of the current. If a five-volt generator is used, either five baths with the plates in parallel may be connected in series, or five pairs of plates in each bath may be connected in series, as each pair of electrodes requires but 0.7 to 1 volt. The distribution of plates in parallel will depend upon the aggregate surface of such plates to the current. Under proper working conditions the current for copper deposition in the acid bath should be from 0.11 to 0.13 ampere per square inch. If there are 20 equal pairs of plates with a total cathode area of 400 square inches, and all of the couples are connected in parallel, the current should be from 44 to 52 amperes. If the electromotive force is two volts and the plates are divided into two groups, each consisting of 10 pairs of electrodes, and these two groups are connected in series, a current of only 22 to 26 amperes is necessary. With an electromotive force of four volts the 20 pairs of plates are subdivided into four groups in series with five parallel couples each, and the current required will be 11 to 13 amperes.

With a current of one ampere there should be deposited 18.26 grains of copper an hour; therefore, a current of 0.12 ampere per square inch of cathode surface should deposit about 2.2 of copper per hour per square inch of plate. To ascertain the average current strength a deposit electrotype plate should be weighed carefully after drying, then the weight in grains divided by the number of hours which were required for its deposition gives the weight deposited per hour. The weight per hour divided by the area of the plate in square inches gives the weight of copper deposited per square inch per hour. Finally this last number divided by 18.26, the weight of copper per ampere per hour, is the average strength of the current expressed in amperes.

The character of the deposit and the adjustment of the current can be determined by an experienced observer. A film of copper should be observed to cover the whole surface of the metal plate immediately after placing it in the bath. This copper should have a rich reddish-yellow color. A dark brown deposit usually indicates a more or less spongy copper and too much current, while an indication of gas being given off at the cathode is indicative of a much too excessive current. A tardy formation of copper of a pale shade indicates that the current is too weak. The proper current density can be checked by the method previously given. The actual thickness of the deposit required depends upon the particular use to which the plate will be placed. If it is to be backed or strengthened by another metal the thickness of heavy writing paper will suffice, but a thickness of from 0.1 to 0.6 of an inch will be required for the copper used without backing metal. When the precipitation is completed the deposit is removed from the plate by the insertion of fine chisels between the plates. Made-up forms consisting of type and cuts, such as an advertising page, may have electrotype reproductions. The form is thoroughly



Section of Engraving Department in a Publishing Plant.

cleaned and dried and plumbago applied with a fine brush and the excess removed.

Meanwhile the wax should have been prepared to receive the impression. A cast-iron mold box is gently heated and filled with a wax and turpentine composition which is quietly melted in a steam vessel and poured into the box until filled. Air bubbles forming on the surface are removed by touching them with a hot iron. The surface is then covered with plumbago and brushed over with a soft brush and the excess plumbago removed. In place of these iron boxes, brass cases of the same size and shape are used to a considerable extent, these having a special electric "connection gripper" which serves to suspend the mold in the solution and at the same time make connection with the surface of the mold. The form is then placed face downward on the wax surface and submitted to immense pressure by a press. When the pressure is released the wax plate is removed from the form and the surface thoroughly black-leaded. This is generally accomplished by a black-leading machine consisting of a large rectangular frame with a box beneath, a cover over the whole, and a trellis table to support the wax matrix. A reciprocating motion is imparted to the table and the brush works the plumbago into the matrix.

Next is the electro-depositing process and electrical connections must be arranged first by imbedding a framework of warm copper wire around the wax edges of the mold, then black-leading the wire to insure good contact with the plumbago coating on the wax, and then attaching the wire to the cathode rod of the bath. When the electric "contact gripper" is used no further trouble need be taken.

The tray of wax is at once transferred to the acid-copper bath, in which it may be suspended after the manner recommended for steel engravings. It is advisable to increase the voltage beyond normal at the start in order to force the copper deposit over the comparatively weak conducting surface afforded by the plumbago. Copper should be deposited immediately on the conducting wire and should gradually spread from this until the whole surface is covered, when the voltage should be reduced. The metal should then continue to precipitate evenly over the entire plate until it has attained a thickness of 1/100 up to 1/32 of an inch which is generally adequate. Progress is tested, as in depositing upon metallic plates, by gently lifting one corner with a penknife. From four to fifteen hours is generally sufficient time to complete the deposit. When sufficient copper has been deposited the frame is removed, rinsed with water on a level or slightly sloping board, and suddenly flooded with hot water on the back of

the newly deposited metal, when the wax may be detached. The metal is then cleansed and the back filled with tin-lead alloy, which is surfaced, and the completed electro mounted on a wood block.

A Typical Installation.

That individual motor-driven machinery is replacing the single-motor system is shown in a typical Chicago plant, where lower power bills, more floor space and convenience and cleanliness have resulted from the change to the more modern method of operation.

The natural light in this plant is excellent. The machines are all driven by indivduial motors, in nearly every case mounted on the machines, either belted, or in a few cases, direct-connected, so that there are no overhead belts. The wiring is carried through conduits, and the general appearance of the shop is particularly clean and attractive.

Energy at 220 volts is supplied by the Commonwealth Edison Company, Chicago.

In the processes used in producing electrotypes, the first machine used is the wax shaver, a machine into which the wax plates are placed to be shaved smooth and even after the wax, in its natural form, has been melted and run out, to the thickness of about one-sixth of an inch, on metal plates. The cutter has a reciprocatory motion, cutting the wax material in going forward and passing over it freely in reversing. A one-horsepower compound-wound reversible motor, running at a speed of 1,200 revolutions per minute, is used to operate this machine. A motor starter equipped with special attachments for inserting dynamic resistance across the armature of the motor is usually used for quick stopping.

After the wax plate is trimmed it is ready for the molding press. This is a powerful hydraulic machine capable of a pressure of 800 tons, if necessary, obtained through a motor-driven triplex oil pump. The type matter sinks into the wax, under this pressure, and an absolutely perfect impression is obtained. The plant under consideration is equipped with two of these molding presses. One is a 24 by 30 and is driven by a two-horsepower shunt-wound motor, running at 1,100 revolutions per minute. In this press the motor is geared to the pump. The other machine is 32 by 25 and is driven by a three-horsepower shunt-wound motor belt-connected to the pump. This motor has a speed of 1,825 revolutions per minute. The pump in this press is built in the base and runs constantly in oil, the oil being used also as the medium for conveying pressure to the plunger.

After obtaining the pressure desired in the wax plate, it is then ready for the polishing machine. This machine, frequently called a black-leader, is used for coating the wax with black lead. It is equipped with six large soft badger's hair brushes, moving rapidly up and down by reason of being mounted on eccentric rods. These brushes work the black lead into and polish the smallest indentations, the plates being carried back and forth under these brushes on a slowly moving bed. A one and one-half horsepower shunt-wound belt-connected motor is used for driving this machine, the motor being mounted as an integral part.

After some minor operations to prepare the wax matrices for the electroplating bath, they are thoroughly washed, a positive pump being used to give increased pressure to the water. This pump is driven by a one-horsepower shunt-wound belt-connected motor.

The plating dynamo in this plant is an Ostrander-Seymour 2,000-ampere compound-wound six-volt electroplating machine.

Individual-Motor Drive in a Chicago Engraving Establishment.

It is mounted on an iron bed plate and coupled direct to a 20-horsepower Roth motor. The motor and generator are insulated from each other on the base, and an insulating coupling is used which is of a flexible type. To prevent what is known as burning and to secure an absolutely even deposit on all portions of all plates, the plating solution is constantly agitated by air which is pumped into it through perforated lead piping. This pump is gear-driven by a one-fifth horsepower motor running at a speed of 1,075 revolutions per minute.

The plate is removed from the bath after a thin shell of copper has been deposited, washed with acid, and a sheet of tin foil placed over it. It is then taken to a cooling table, and after being backed with melted lead, is cooled by a motor-driven blower. This blower is mounted under the cooling table, two air outlets being provided from the blower piping.

The complete cast is then taken to the roughing machine. This machine, which cleans the backs of the metal plates before they are mounted on wood, is driven by a two-horsepower motor running at 1,100 revolutions per minute, which is mounted directly on the machine and geared to it. The power shaver directly driven by a two-horsepower motor planes the plates to the required thickness.

There are numerous other machines used in this establishment for sawing, trimming, planing and routing both wood and metal. The saws are driven by one and one-half horsepower shunt-wound motors with a speed of 1,800 revolutions per minute. The motors are mounted under the machines on brackets and belted up through the frame of the machine. Idlers are provided for maintaining a proper belt tension. The trimmers are similar in their design to the saws and are driven by three-quarter-horsepower shunt-wound motors running at 2,350 revolutions per minute. These motors are also provided with idlers. A two-horsepower shunt-wound motor of the vertical type, having pulley down, is used for driving a Daniels wood planer. This machine has a revolving head fitted with two tools mounted on a vertical shaft and is used for planing the wood blocks to a certain thickness before the plates are mounted thereon. The routers, machines for routing out or removing certain portions of the plate, are also driven by motors of the vertical type, these being, in this case, three-quarter-horsepower machines having a speed of 2,350 revolutions per minute. The routing machines themselves run at a speed of 15,000 revolutions per minute.

The nature of this business is such as to produce a great amount of dust and dirt, and it is therefore necessary to have all motors of the inclosed type when exposed to the dirt.

POWER REQUIRED TO DRIVE ELECTROTYPING AND STEREOTYPING MACHINERY.

Application	Horsepower
Boyle router	1
Wesel Daniel planer	2
Roughers	2
Combined drill and jig saw	0.5
Trimmer	0.5
Saw	0.5
Small planer	0.5
Agitator	1
Zinc etching rocker	1
Black leader	0.5
Molding press	4
Plate reducer	2
Bender	3
Flat shaver	3
Wax shaver	0.5
Etching machine	3
Etching tubs	0.5
Autoplate machines	10
Scorcher	0.5
Trimmer	3
Double-page shaver	3
Double-page tail cutter	2

Central-Station Service to Displace Isolated Plant in Chicago Brewery.

The Commonwealth Edison Company, Chicago, has signed a contract to furnish service to the Gottfried Brewery Company, displacing an isolated plant. The contract calls for a maximum demand of 795 kilowatts. Plans are being made to completely electrify the plant, which will be the first of its kind in Chicago to be placed entirely on central-station service.

Available Water Powers of Arkansas.

By S. E. Dillon.

The states of the South, east of the Mississippi River, are reaping a rich reward from the development of their many water powers, which were primarily used for cotton manufacturing industries, but with improvement in electric transmission and consolidation by large companies are now sending power to all cities and towns in those states.

The people of the states west of the Great River have, however, been slow to avail themselves of the benefits of the development of the power from their streams.

The state of Arkansas is gridironed with rivers and streams from north to south and west to east on nearly all of which water power can be economically produced, but thus far the Spring River, at Mammoth Spring, and at another dam a few miles below that point has the only development of any consequence in the state.

The White River, which rises in Arkansas and flows north into Missouri and then comes back into the state, has been utilized for power purposes at Hollister, Mo., where, with a dam 56 feet high, 12,000 horsepower is developed and Lake Taneycomo, 25 miles in length, is created, which is being used as a pleasure haunt and a number of clubs and summer camps are being located on its shores. This river has a number of locations in its main channel and its tributaries in Arkansas, where quite important water powers could be located, as shown by the report of A. H. Purdue, state geologist, published by the state in 1911. Its more important tributaries are the Buffalo Fork and the Little Red River.

The fall in the Arkansas River within the state is too slight to make possible any power development in its course. The Ouachita River and tributaries, however, present a number of splendid opportunities for the development of important water powers.

This stream has been fully investigated, mapped and reported on as to rain fall, stream flow, run off, storage and power development by the United States Engineers to the War Department for the use of the committee on rivers and harbors, House of Representatives, known as document No. 588. This report shows that at one point about 10 miles northwest of Hot Springs a dam 214 feet in height above the bed of the river with a crest length of 1,120 feet could be built across the river between two hills of rock and that with such a dam 22,500 horsepower could be produced at all times.

During the year just past the Army Engineers have again gone over the data and surveys of this river to determine the feasibility of utilizing it for the government nitrate plant, for which $20,000,000 has been appropriated.

About six miles southeast of Hot Springs, at Ross Ford, the state has granted a franchise to the Ouachita Power Company, of Little Rock, Ark., to build a dam for water power, but they have not yet undertaken its development. This is a most advantageous situation for such an enterprise, being located so near to a city of the size of Hot Springs, which is also a great natural sanitarium and pleasure resort. If a dam of 60 to 100 feet in height, which they propose, were built at their dam site, it would produce a lake some 10 or 12 miles in length, the waters of which would come up to within two miles of the center of Hot Springs and thus, by giving a place for rowing, motor boating and fishing within easy access, greatly add to the attractiveness of this popular watering place.

A dam of the height contemplated would, with the stream flow shown by the government report, produce from 6,000 to 8,000 horsepower and give Hot Springs and other cities in the vicinity cheap power and lights and probably result in the location of a large cotton-duck mill and other cotton and similar manufacturing industries near the power site or adjoining Hot Springs.

The Progress of Electricity in Denmark

Statistics on Central-Station Conditions Compiled With the View to Giving American Manufacturers Data Which Are Essential if the Export Business to This Growing Country Is Desired

By JOHN J. DUNNE.

ELECTRIC supply stations, according to the latest official statistics, have had a mushroom growth in Denmark. Since the first one was erected in Copenhagen in 1892, the use of electricity for light and power—and to some extent for traction—has extended to the provincial towns large and small, to the villages, to the manorial houses and even to groups of more or less detached farm houses.

In May, 1905, the total number of electric supply stations was 43; in May, 1914, the total was 412; an increase of 369 stations, or 834 per cent in nine years.

The main cause of this rapid development is the low cost of production. This enables electricity to compete with gas and petroleum for lighting purposes. In 1894 the cost of current in Copenhagen was 21.3 cents per kilowatt-hour for lighting (with a rebate for large consumers), and eight cents per kilowatt-hour for power; in 1913 the average price of current for lighting was 7.2 cents per kilowatt-hour, that for power 3.8 cents per kilowatt-hour.

In the three largest Danish cities there are electric trams—overhead trolley wire system. These are operated by high-tension, direct current at a pressure of 550 volts. The fare is three cents.

Table I shows the distribution and growth of the electric supply stations which sold energy between 1905-1913.

TABLE I.—CENTRAL STATIONS IN DENMARK, 1905-1913.

Erected in the Year	Electric Supply Stations		Total Number of Supply Stations
	in Town	in the Rural Districts	
1905 or before	16	27	43
1906	9	22	31
1907	8	29	37
1908	3	49	52
1909	8	26	34
1910	7	38	45
1911	10	44	54
1912	5	48	53
1913	1	38	39
Total	67	321	388

It will be observed in Table I that 321 supply stations, or 82 per cent of the total number are in the villages and rural districts. It may be safely inferred, therefore, that the Danish food-producers are at least as intelligent, as closely in touch with the spirit of the age and as progressive as the industrial and commercial dwellers in the towns. This state of affairs is by no means a reproach to the efficiency of educational administration in Denmark.

Of the 67 electric supply stations (18 per cent of the total) in the towns, six are situated in Copenhagen; five of these stations are municipal properties and one is the property of the Copenhagen Free Harbour Company, Ltd. Of the remaining 61 in the provincial towns 55 are municipal properties and six belong to private companies. Of the most important rural plants 182, or 57 per cent are co-operatively owned; 23 belong to limited companies; 33 to private companies; and only six are communal property. The form of ownership for 77 plants was not ascertained.

DENMARK AFTER THE WAR.

The statistics presented in this article show a somewhat remarkable development in electricity supply in Denmark, particularly since 1905. As an example, there were 43 central stations operating in 1905 as compared with 388 at the beginning of 1914.

Subsequent development has, of course, been curtailed by the war, but plans are being formulated to make comprehensive extensions as soon as material can be obtained.

American manufacturers can well afford to study the conditions in this country with a view to participating in the business which will develop at the close of the war.

Of the 388 electric supply stations only 15 produced alternating current (usually three-phase), the remaining 373 produced direct current. Table II shows the voltages of the direct current plants.

The normal pressure of the 15 high-tension plants producing alternating current varied between 2,000 and 10,000 volts. The current is transformed before reaching the consumer by means of 360 transforming stations; 10 plants deliver either 220, or 380 volts, respectively for light and power and three others 127 and 220 volts.

These high-tension plants are chiefly situated in the rural districts and are calculated to supply farms lying far apart with electric light and power. It is very probable that this form of electrical energy has a future before it. The following facts point in that direction. In the course of the year 1914 and the first month of 1915, no fewer than 11 plants for the production of alternating current were erected; 400 transforming stations were attached to the 11 plants. At the end of 1915, there were 26 plants of this type working in Denmark having more than 700 transforming stations.

The engines running the 388 plants represented at the end of 1913 an aggregate of about 85,000 available horsepower; that is to say, 37,000 horsepower in Copenhagen; 28,000 horsepower in the provincial towns; and 20,000 in the rural districts.

Detailed information was obtained from 306 plants in 1913 and the aggregate normal capacity of their generating sets was 55,000 kilowatts; these produced in the course of the year electrical energy amounting in the aggregate to 67 million kilowatt-hours.

Table III includes 388 electric supply stations and shows their output of energy and its value in 1913.

As indicated by the column on the right of Table III, the total output of energy in 1913 amounted to about 66 million kilowatt-hours. Of this amount 39 million units were generated in Copenhagen; 17 million in the provincial towns; and 10 million in the rural districts.

TABLE II.—VOLTAGES OF DIRECT-CURRENT PLANTS IN DENMARK.

Volts	Town Plants	Rural Plants
220	44	115
220	9	155
110	16	9
110	1	42

In Table IV the output of current in 1905 is compared with that of 1913.

Table IV shows that the total output of energy has increased by nearly 56.5 million kilowatt-hours, or 563 per cent in the course of nine years.

With regard to the uses to which the energy is applied Table V shows that nearly as much is used for lighting purposes as for power.

TABLE III.—OUTPUT OF ENERGY DURING 1913.

	No. of Electric Supply Stations	For Light		For Power		For Own Use 1,000 Kilowatt-Hours	Total Output in 1,000 Kilowatt-Hours
		Quantity in 1,000 Kw. Hours	Value Dollars	Quantity in 1,000 Kilowatt-Hours	Value Dollars		
Copenhagen	6	17,996	1,305,000	19,672	753,000	1,283	38,951
Provincial towns	61	8,939	856,000	7,667	300,000	431	17,037
Rural districts	321	4,377	451,000	4,611	209,000	1.438	10,426
All Denmark	388	31,312	2,612,000	31,950	1,262,000	3,152	66,414

The number of watt-hour meters used by the 388 stations is set forth in Table VI.

Some of the meters classified under light, measure both light and power at the same price. The annual hire of a meter is about 50 cents.

The average amount of electrical energy measured per meter is shown in Table VII.

TABLE IV.COMPARISON OF OUTPUT DURING 1905-1913.

Year	Output Copenhagen, Kilowatt-Hours	Output Provincial Towns, Kilowatt-Hours	Output Rural Districts, Kilowatt-Hours	Total Danish Output, Kilowatt-Hours
1905	8,188,000	1,639,000	252,000	10,009,000
1913	38,951,000	17,037,000	10,426,000	66,414,000

The electrical energy sold in 1913 brought nearly four million dollars. About 65 per cent of this amount was paid for light and about 35 per cent for power. The average price of current per kilowatt-hour was lowest in Copenhagen and highest in the rural districts.

TABLE V.—PERCENTAGE OF ENERGY USED FOR LIGHTING AND POWER.

	Light Per Cent	Power Per Cent	Own Use Per Cent	Total Per Cent
Copenhagen	46.2	50.5	3.3	100
Provincial towns	52.5	45.0	2.5	100
Rural districts	42.0	51.5	6.5	100
Denmark	47.0	49.3	3.6	100

As a general rule the larger the plant the cheaper the current and vice versa. The cost of energy in the rural districts was higher than the average quoted in Table VIII.

As there are two large rural plants, which supply a very large area with energy, the influence of these on the general average renders the latter somewhat misleading. Table IX gives a more accurate account of the average prices paid for current to plants with an annual output of 10,000 to 40,000 kilowatt-hours.

TABLE VI.—NUMBER OF METERS IN USE.

	For Light	For Power	Total
Copenhagen	59,000	4,600	63,600
Provincial towns	56,900	6,300	63,200
Rural districts	32,100	8,200	40,300
Total	148,000	19,100	167,100

Two facts are forced upon the readers' attention by the foregoing table, viz.: (1) That the prices charged for energy by small plants are higher all round than those charged by large ones. (2) That the prices charged by plants having an annual output under 40,000 kilowatt-hours do not vary in any appreciable degree. It is obvious, therefore, that only large plants can afford to sell energy cheaply.

Statistics, as to when the heaviest load occurs, point to the Christmas season in the cities and towns, and to the months of August and September (threshing season) in the rural districts.

Were the maximum loads of all the generating sets to occur at a given period of time and be added together, they would represent 75 per cent of the aggregate maximum capacity of the plants in Copenhagen; 70 per cent of that of the provincial towns and 80 per cent of that of the rural districts.

TABLE VII.—ENERGY MEASURED BY METER.

	Light, Kilowatt-Hours	Power, Kilowatt-Hours
Copenhagen	305	4,290
Provincial towns	157	1,217
Rural districts	137	562
Average for Denmark	212	1,673

Detailed information from 306 plants shows that their storage batteries, if fully charged, would represent an aggregate auxiliary energy of 9,600 kilowatts, i. e., 4,300 kilowatts in Copenhagen; 2,600 kilowatts in the provincial towns; and 2,700 kilowatts in the rural districts.

With regard to the utilization of the maximum capacity of generating plants in the city, the towns, and the rural districts, it must not be inferred that the rural plants are utilized in a more intensive manner than those in the city and provincial towns, as such is not the case. On the basis of detailed information, it was found that for each kilowatt of capacity of the aggregate plants, the average annual output in Copenhagen

TABLE VIII.—AVERAGE PRICE OF ENERGY.

	Average Price per Kw.-Hour Paid in 1913 for	
	Light, Cents	Power, Cents
Copenhagen	7.2	3.8
Provincial towns	9.5	3.9
Rural districts	10.2	4.3
Denmark	8.3	3.9

was 1,476 kilowatt-hours; in the provincial towns 950 kilowatt-hours; in the rural districts 855 kilowatt-hours. If these figures be compared with the number of hours in a year of 365 days, the average output of the Copenhagen plants amounted only to 16.8 per cent of their normal capacity; that of the provincial plants to 10.8 per cent; and that of the rural districts to 9.8 per cent.

Fuel-Consumption Statistics.

With regard to the fuel consumed, Table X will give an idea of the fuel consumption in Copenhagen and in the provincial towns during 1913, and its nature.

Of 61 plants in the provincial towns 35 used crude oil; five coal only; four gas only; four used gas and crude petroleum; two coal and gas; and seven oil and gas.

The Copenhagen plants using coal only consumed an average of 3.02 pounds of coal in producing one kilowatt-hour; those in the provincial towns consumed 4.16 pounds per kilowatt-hour.

The average consumption of crude petroleum in the provinces was 0.868 pound per kilowatt-hour; that of gas 10.624 cubic feet per kilowatt-hour.

Fifty-five plants in the rural districts consumed 2,036 tons

TABLE IX.—AVERAGE PRICE FOR CURRENT IN THE RURAL DISTRICTS.

Output	Light per Kilowatt-hour, Cents	Power per Kilowatt-hour, Cents
Up to 10,000 kw. hours	11.2	6.4
From 10,000-20,000	11.5	6.0
From 20,000-30,000	10.7	5.9
From 30,000-40,000	10.4	5.7
Over 40,000	10.4	5.4
Average	10.7	5.9

of coal in producing 1,108,000 kilowatt-hours, whilst 83 plants consumed 1,122 tons of oil in producing 2,097,000 kilowatt-hours. Consequently, the average consumption of coal per kilowatt-hour was 4.05 pounds; that of oil 1.179 pounds.

The Danish trade in electric goods and accessories is pretty large and has been heavily handicapped by the war owing to the difficulty in procuring supplies and the scarcity of raw materials, especially copper and brass. Brass electric lamp sockets wholesaled at four cents each before the war are wholesaled now at 16 cents to 20 cents each.

What is behind this widespread popular use of electricity in rural Denmark? There are four fundamental factors.

(1) Efficient educational administration as instanced by the forcible effect of the modern electric plants usually found in the popular Danish high-schools, agricultural schools, domestic

TABLE XI.—KIND OF CURRENT AND VOLTAGE IN USE IN

6 plants in Copenhagen consumed, tons of coal	51,930
13 plants in the provincial towns consumed, tons of coal	10,627
1 plant in Copenhagen consumed, tons of crude petroleum	207
44 plants in the provincial towns consumed, tone of crude petroleum	4,521
13 plants in the provincial towns consumed, cubic feet of gas	11,226,852

schools, gardening schools and smallholders schools upon the adult and junior pupils that undergo long or short courses in these schools.

(2) The real-estate bookkeeping carried out by the State, which facilitates the sale and transfer of real estate and reduces the expense of same to a tenth or twelfth part of the amount usually paid in England and the United States, and gives state-guaranteed security with regard to title, liens, mort-

TABLE X.—FUEL CONSUMPTION OF DENMARK STATIONS. THE TEN LARGEST DANISH CITIES.

Name of City	Kind of Current	Voltage
Copenhagen	Direct	220
Aarhus	Direct	220
Odense	Direct	220
Aalborg	Direct	220
Horsens	Direct	220
Randers	Direct	220
Vejle	Direct	220
Esbjerg	Direct	220
Helsingor	Direct	110
Fredericia	Direct	220

gages, etc. Authorized persons can examine the real-estate books and the exercise of this privilege furthers and facilitates business by enabling bankers, merchants, farmers and the general public to obtain full and reliable information about real estate free of charge.

(3) The co-operative mortgage associations, which further rural enterprise by means of loans for periods of 30-60 years at 4.95 per cent. The essential problem of credit for such long periods is solved by the issue of negotiable mortgage bonds which replace the capital loaned. The unlimited liability of the co-operative mortgage association on the one hand and that of the co-operative electric supply station or other enterprise on the other constitutes the strongest incentive to prudence, caution, and frugality. As a rule, the co-operators effectually limit their liability in actual practice. The co-operative mortgage associations must be sanctioned by the state which twice annually audits their accounts. The aggregate real estate of the co-operators may not be mortgaged for more than 50 per cent of its market value.

(4) The dissemination of economic and other useful knowlegde by means of popular winter lectures and technical short courses held in nearly every parish in Denmark. These form a fairly efficient connecting link between science on the one hand and the actual problems of daily life on the other.

Table XI shows the kind of current and voltage used in the 10 largest Danish cities.

As the table indicates, direct current is used in all the Danish cities. In Copenhagen and Odense, however, alternating current is produced in a minor degree for the purpose of supplying villages and villa quarters at some distance from these cities with electricity. The voltage, phase, and frequency of the alternating current supplied as follows:

Name of City	Voltage	phase	Frequency
Copenhagen	3x120/127	3	50
Odense	3x208/120	3	50

In conclusion, it should be stated that Denmark holds the products of American manufacturers in very high esteem and would undoubtedly welcome a comprehensive effort on the part of electrical manufacturers in the United States to secure at least a portion of the business.

ANNUAL PROGRESS MEETING OF THE BROOKLYN EDISON COMPANY.

Statistics Presented Show Company Has Had Exceptionally Successful Year—Many New Contracts Secured.

T. I. Jones, general sales agent of the Brooklyn Edison Company, made his annual address on "The Growth of the Company During 1916" at the January meeting of the Brooklyn Section of the National Electric Light Association.

By slides and charts Mr. Jones showed many notable lighting and power installations made during the year and the advances made in the different branches of the company's business.

In 32 of the largest contracts, the Brooklyn Edison Company signed up a total of 28,649 horsepower. Eight large private generating plants and 31 steam plants were replaced by Edison service, totaling 9,882 horsepower. Eighteen gas engines, ranging from 4 to 155 horsepower, were replaced, totaling 704 horsepower.

The company has had an increase of over 175 per cent in new business since 1912.

Mr. Jones also spoke on the rate changes recently put into effect in Brooklyn, which means a total annual saving to the retail customers of approximately $670,000.

W. F. Wells, vice-president of the company, addressed the meeting on the progress made in the Brooklyn company during the past 25 years, the time which Mr. Wells has been with the company. In 1892 the Brooklyn Edison Company had but 100 employees, whereas now there are over 2,500.

Mr. Wells brought out the fact that the company has approximately $16,000 invested for every employee. He also mentioned the new issue of bonds about to be made by the company, urging the advisability of employees investing their savings in the securities of the company.

An interesting paper on "Selling Central-Station Power" was read by E. A. Leslie, of the Power Engineering Bureau.

Activities of New England Central-Station Companies.

The Plymouth (Mass.) Electric Light Company has offered three prizes, of $25, $15 and $10, for the best and largest number of suggestions for safety devices to prevent accidents among its employees, which employees may offer during 1917.

Suggestions are to be made to the manager, E. P. Rowell, and will be referred for decision to the board of directors.

The Lynn (Mass.) Gas & Electric Compnay has added an adjoining store to its office and salesroom space. The addition, 85 by 35 feet, is furnished as an appliance department. Here are displayed a large variety of domestic appliances. The company's holiday business was the largest in its history.

Mixing Sociability with the "Safety" Meeting.

The Texas Power & Light Company has for some months had under way a "Safety" campaign to reduce accidents and to educate employees in the prevention of accidents.

A meeting was held recently by one of the branch offices of the company which was in the form of a "get-together" dinner combined with the monthly safety meeting. Most men like to eat and it has been proved, in this case at least, they are eager and willing to come out to these meetings. The dinner consisted of an old-fashioned barbecue and was served on plank tables in the company's shop. The city electrician, on invitation, made a talk on "Safety in Motor Installations."

Company Wins Alleged Defective Wiring Case.—Attempts of two property owners to obtain a judgment from the Danville (Ky.) Electric Light Company failed when the case was tried in court. The company's contention that it was not responsible for the wiring on the premises of the panies, and meter readings would govern charges.

COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

A YEAR OF HOUSE WIRING IN DAYTON.

Information As to the Activities of the Dayton Power & Light Company Which Resulted in Securing 2,584 Contracts During 1916.

By Thomas F. Kelly.

Residence business in Dayton has been developed through a flat-rate-per-outlet house-wiring proposition in co-operation with local electrical contractors. During the years of 1914 and 1915, 2,565 old houses were wired and in the three years ending December 31, 1915, the company added 7,215 customers.

The schedule reproduced herewith has applied in Dayton during the years mentioned, and under this arrangement the salesmen of the company secured the business and turned the wiring contracts over to the contractors in alphabetical rotation.

Price-List Form of Outlets and Hardware.

GENERAL.—All openings for switches, receptacles, drop cords and fixtures are considered as outlets, and based on a unit price for houses of different classes of construction.

The cost of switches, receptacles and drop cords should be added to the price of outlets and this sum will be the contract price for all labor and material necessary to complete the work as outlined in the schedule.

All extra outlets, switches, receptacles and drop cords will be charged for at the rates according to the class of house for which the contract is written.

OUTLETS.

No. of Outlets	Class A Single Flooring	No. of Outlets	Class A Single Flooring
8	$24.03	34	$ 65.39
9	26.23	35	66.93
10	28.43	36	68.47
11	29.97	37	70.01
12	31.51	38	71.55
13	33.05	39	73.35
14	34.59	40	75.16
15	36.13	41	76.97
16	37.67	42	78.77
17	39.21	43	80.57
18	40.75	44	82.37
19	42.29	45	84.18
20	43.83	46	85.98
21	45.37	47	87.79
22	46.91	48	89.59
23	48.45	49	91.40
24	49.99	50	93.20
25	51.53	51	95.00
26	53.07	52	96.81
27	54.61	53	98.61
28	56.15	54	101.41
29	57.69	55	102.22
30	59.23	56	104.02
31	60.77	57	105.83
32	62.31	58	107.63
33	63.85	59	109.43
		60	111.24

Class B—Mixed Flooring.

Prices as per Class A, except as below:

Located under double flooring, second or third story:	
Ceiling outlet	$1.00 extra
Switch outlet (controlling any center outlet)	1.00 extra
Located under hardwood flooring, second or third story:	
Ceiling outlet	$3.00 extra
One switch outlet (controlling any center outlet)	3.00 extra
Additional switch outlets on same gang (controlling same center outlet), each	1.50 extra

Class C—Mixed Walls.

Outlets appearink on brick walls	$4.50 extra

HARDWARE.

Push-button switches, each	$1.25
Push-button three-way switches, per set of two switches	3.50
Push-button four-way switch	2.45
Three-way snap switches, per pair	1.95
Porcelain-base switches, each	.50
Porcelain Edison receptacles, each	.30
Bryant flush-plate receptacle	.80
Chapman flush-plate receptacles, each	1.15
Drop cord key socket, each	.65
Drop cord chain socket, each	.85

The contractors financed the house wiring on the basis of 20 per cent paid when the contract was executed and the balance in easy payments, the customers being allowed five months in which to pay in full.

Participation in National Campaign.

With the announcement of the national "Wire-Your-Home" month campaign, the Dayton Power & Light Company at once made plans to "cash in" on this national movement and arranged a special wiring offer with the co-operation of eight of the leading electrical contractors, all of whom maintain stores and are electrical dealers. In consideration of the fact that the company would secure the contracts, conduct a live publicity campaign and finance the wiring contracts, the contractors agreed to do the work for 15 per cent less than the regular schedule of prices. As an additional inducement, the central station agreed to allow an extra five per cent discount on all bills paid upon completion of the work. On all contracts a payment of 10 per cent of the cost of the work was required upon the executing of the contract, the balance to be paid in 12 equal monthly installments. It was estimated that 200 wiring contracts would be closed in Dayton during the month and four salesmen were detailed for this work.

On Wednesday, March 15, a special advertisement announcing the campaign was run in the two evening papers. A similar announcement appeared in the morning paper on the following day. The telephones in the sales department worked overtime from 8 o'clock Thursday morning, March 16, until Saturday, April 15, with people asking to have salesmen call on them to estimate the cost of wiring their homes. In fact, because of the large number of inquiries received and the necessity of giving prompt attention to them, it was found necessary by Tuesday, March 21, to secure the temporary services of six bright young men from the meter-testing and maintenance departments of the company. These men were competent wiremen, and with a little coaching were "turned loose" on the mass of inquiries, with the result that in Dayton alone during "Wire-Your-Home" month there were secured 560 wiring contracts.

In addition to the 560 contracts above mentioned, the eight contractors who were co-operating secured approximately 200 contracts for wiring old houses. It is figured also that the other wiring contractors, those who have no stores, etc., secured 120 contracts. It is conservatively estimated, therefore, that altogether 880 contracts were closed for the wiring of already-built houses in Dayton during the month. The cost of wiring the 560 houses contracted for by the company totaled $24,125.87, an average of $43.09 per house, which, of course, does not include the fixtures. At the same average cost per house the total revenue received by all contractors as a result of the campaign would be $34,644.36.

A notable feature of the campaign was the fact that every contract was closed in the following up of inquiries which had been received in response to the newspaper advertising. For while it had been the intention to conduct a house-to-house canvass when the campaign was inaugurated, the men soon became too busy following up live inquiries to undertake the work.

Another interesting point developed was the question as to

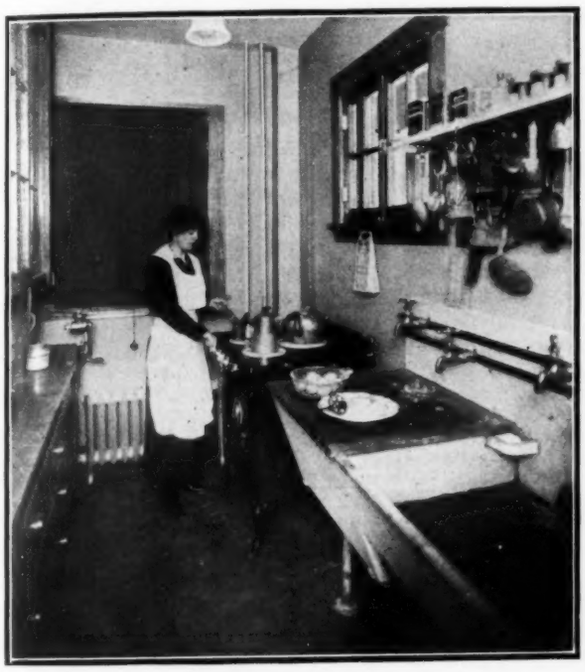
how to pay the temporary salesmen, in view of the fact that ordinarily these men would be entitled to time and a half for overtime work in the evening, which was the best time for closing a large number of wiring contracts. This question was settled by paying them regular time for day work and a commission of 50 cents for every wiring contract secured.

Efforts to secure house-wiring contracts continued during the year with the result that in Dayton in 1916 contracts were closed covering the wiring of 2,584 old buildings and the number of Dayton customers were increased 24 per cent, or 3,377.

The company is now making plans to "cash in" on the national house-wiring campaign that will be conducted this year under the auspices of The Society for Electrical Development, from April 1 to May 15.

Convenience of Electric Ranges Shown.

The accompanying illustration shows an electric range installed in a small kitchen in a Western home and shows in a very convincing manner how little space is required by the electric as compared with the gas or coal range. Aside



Electric Range Installed in Small Kitchen.

from the actual floor space, it would be inadvisable to use either a coal or gas stove in the cramped quarters shown, for safety reasons.

Cooking Instruction for Central-Station Employees to Popularize Electric Method.

A novel kind of educational work for employees is being conducted by the Boston Edison Company, which is holding systematic instruction in "electric cooking" for its women employees. Two classes have thus far been formed, of 15 students each. These meet at the House of Edison Light, at Arlington, where the young ladies cook a dinner by electricity under the instruction of the women demonstrators stationed there. The class partakes of the dinner after it has been prepared.

The object of the instruction is to spread a knowledge of the electric-cooking idea so that the girls will be active missionaries in spreading abroad the advantages of this kind of domestic science. Classes will continue as long as there are candidates.

Electric Water Heating in Boston.

In the territory served by the Boston Edison Company, power used in electric water heating is supplied under the Miscellaneous Energy Rate. Under this rate the first 10 kilowatt-hours in each month are charged at 10 cents per kilowatt-hour; all remaining kilowatt-hours in the month are charged at two cents per kilowatt-hour.

In the average electric home of today, where various appliances, such as flat irons, toasters, percolators, radiators, and ranges are used, it can be easily understood that the first 10 kilowatt-hours are very soon used up leaving the majority of the monthly consumption to be billed at two cents per kilowatt-hour. There is a service of value in every home, of which every householder using 10 kilowatt-hours on other appliances may take advantage, at a moderate cost. This is electric water heating, according to the experience of the Boston Edison Company.

For the ordinary house boiler of 30 or 40 gallons, a 3,000-watt electric water heater meets the demand of the ordinary family. They are put in several types and sell from $25 to $30.

This electric heater is connected like an ordinary circulating heater so that it draws cold water from the bottom of the boiler and delivers hot water into the top of the boiler. Generally, the hot water from the heater is not delivered directly into the tank but into the hot-water service pipe just above the tank through what is termed a special "non-by-pass tee." This non-by-pass tee prevents cold water by-passing through the heater and cooling the water drawn from the service pipe.

The electric water heater is supplied with a three-heat switch, having full, medium and low heats. On full heat, the heater will deliver about 12 to 14 gallons of water at 150 degrees and from 18 to 20 gallons of water at 120 degrees (bath temperature); thus it may be seen that if the electric water heater is turned on at the beginning of a meal, in 30 to 35 minutes' time there will be ready from five to six gallons of hot water with which to wash the dishes and the cost of electricity for this service will be about three cents. Assuming that this is done each day for every meal, the cost would be nine cents per day or $2.70 per month.

In an average family where there are four people, and assuming two baths a week per person or 32 baths per month, and further assuming that 18 gallons of water at 120 degrees temperature is used for each bath, the cost would be $1.92 per month, an average of six cents per bath.

It is safe to assume that not over 50 gallons of water at 150 degrees Fahrenheit are needed to do the ordinary week's washing. This amount at the above temperature can be obtained electrically for approximately 25 cents. Assuming four or five washings per month the average cost of this hot-water service would be about $1.12 per month. This would bring the total bill for electricity for water heating for one month to about $5.74.

The electric heater can be used as an auxiliary to the coal fire in winter and can be used entirely in summer or all the year round. The company does not recommend the instantaneous type of water heater because when arranged to supply water fast enough for ordinary household service, the amount of current required is so large that the cost to the electric company which provides and maintains the service compels a high rate of charge to the consumer.

Where hot water is to be used continuously, and in such case the boiler is always hot, it is advantageous to use a boiler covering made of asbestos or of magnesia. It is claimed that the loss of heat by radiation can be reduced in this way 60 to 70 per cent.

Electric hot-water boilers when coupled to service pipes are subject to the usual rules for safe installation of range boilers. They must not be connected to a supply pipe containing a check valve either in the pipe or meter, unless a relief-valve set to keep the pressure within a safe limit is also connected with the boiler.

Trial Meter Installations Successful at Boston.

A trial meter proposition has been put in effect by the Boston Edison Company, with gratifying results in the volume of permanent business which it has brought. In an apartment which is wired and has fixtures, and is connected with the company's lines, a meter and Mazda lamps are installed without obligation on the part of the tenant. He is given free service, perhaps a week or ten days, when the company's salesman calls on him and either secures a contract for service or the decision that he wishes service discontinued.

During the time the free trial offer has been in force there have been 2,343 applications. Of these 320 were cancelled because the party failed to move into the apartment, or moved out before the meter was put in. Before the regular application could be secured 148 more were discontinued. The balance, 1,875, were given a short trial service, and a contract followed.

The amount of pecuniary loss, due to current delivered and not paid for, was only $104. Many of the discontinuances resulted in payment for current used, because the period was protracted. It is estimated that an annual income of over $43,000 is secured from the contracts obtained by this means. The trial idea has shown that electric service can be "sold" by sample; that owners of apartment houses can readily be convinced that tenants desire electric service, and that a close relationship can be established with apartment house occupants through the personal solicitation carried on by salesmen. Prospects are approached in the evening when the "men folks" are to be found at home.

A Successful One-Man Campaign in Sandusky.

Speaking before the recent meeting of the New-Business Committee of the Ohio Electric Light Association, G. A. Lowther, of the Sandusky Gas & Electric Company, explained a very interesting campaign carried out with the assistance of only one man.

It was during the hot weather last August when almost everyone was on vacations that we thought we had better make a little effort to get some more electric irons on our lines, and if possible, get a few more old houses wired. It seemed like a bad time, but I was fortunate enough to get hold of a young man who had just graduated from high school and I explained to him that he would gain some valuable experience even if he did not make a lot of money.

We have five contractors in Sandusky and as business was somewhat dull, I got them to agree to pay an equal share of this solicitor's salary and also to pay $1.00 for each house-wiring contract which was secured and turned over to them. In addition to this, we paid the young man 50 cents for each electric iron sold.

I started my recruit out on a house-to-house canvass, and to make matters easy for him, I instructed him to ask to be allowed to demonstrate an electric iron, whether the house was wired or not, the idea being to find out whether the party was interested or whether they had an electric iron already in use.

The recruit got badly discouraged about the fourth day, but I supplied him with a little more ammunition and kept him from deserting. To make a long story short, he worked five weeks and sold 24 irons, one toaster and two fans. He secured a large number of prospects for house wiring, of which I closed nine at that time and I have since closed several more. In addition, we secured a lot of valuable information from his work. For instance, we found that 83 per cent of the consumers called on already had electric irons. Now comes the most important part and that is the cost of this skirmish. I have read a great many accounts of large campaigns and I have very seldom found any mention the cost of placing the business on the lines. In this case, the cost of securing nine new customers, placing 24 irons and three other devices on our lines was practically nothing, because devices were all sold at list price and the profit more than paid our share of the solicitor's salary and commission.

The cost to the contractors was seven per cent and they seemed to be satisfied to get the work at this cost as they realized that it was business they would not have gotten otherwise.

Big Power Contract in West Signed.

The Washington Water Power Company, Spokane, Wash., has signed contracts to deliver electric power to the Intermountain Power Company, of Butte, Mont. This means the operation for the first time of the $5,000,000 hydroelectric power plant at Long Lake, 23 miles down the river from Spokane, completed some 18 months ago. The power purchased will be used in the vicinity of Spokane. The Intermountain Power Company is a corporation recently formed in Butte by Anaconda interests. Charles J. Kelly, president of the Daily Bank & Trust Company, is president of the new company.

Important Electric-Furnace Installation in New Jersey.

The plant of the Atlantic Metals & Alloys Company at Boonton, N. J., has entered into a contract with the New Jersey Power & Light Company for energy to operate an electric-furnace installation consisting of three three-phase furnaces, one of about 300 kilowatts capacity and two about 50 kilowatts capacity each.

It is anticipated that the furnaces will operate 24 hours per day, seven days per week, on which basis the energy consumption will be approximately 3,000,000 kilowatt-hours per year.

Central Station "Clearance Sale" at Boston.

During the month of January the Boston Edison Company is holding a clearance sale of shop-worn and exposed electrical appliances. The plan follows the usual merchandising idea of clearing the shelves of surplus and left-over stock following the holidays. Cut prices prevail for this sale.

In the Edison company's case nothing is offered that is not perfect from a service standpoint and that will not give perfect satisfaction. The appliance department guarantees everything sold. Prices are reduced from 25 per cent off the regular list down to practically cost, though most goods, even those considered obsolete, are sold at a profit.

During February, sick-room and nursery specialties will be featured in an entirely new stock. These will embrace heating pads, vibrators, milk warmers, radiators, etc. In March, washing machines will have the prominence in the appliance shops.

Public-Utility Manager Gives Good Argument for Maintenance of Rates.

A special committee of the Athol (Mass.) Board of Trade has been appointed to try to secure lower electricity and gas rates. A. A. Laughton, manager of the Athol Gas & Electric Company, pointed out that instead of lower rates they should be higher, in view of increased prices of copper, coal and other materials, and labor shortage. He thought it more pertinent that public sentiment be directed against companies which are advancing prices rather than utilities which maintained the same rates in the face of rising costs.

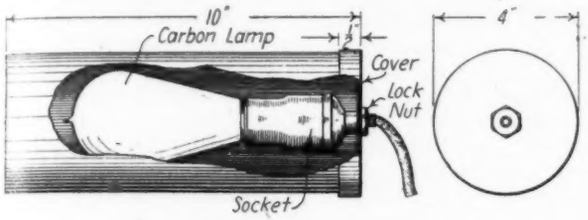
ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

A Simple Home-Made Bed Warmer.

By H. Weiss.

In the accompanying sketch is shown a design for a rough home-made bed warmer, which is quite effective, however. Take a cylindrical tin can about 10 inches long and four inches in diameter. Fasten a socket into the



Simple Home-Made Bed Warmer.

cover by means of a locknut. Use good, reinforced cord for connecting this to any convenient outlet. Put a 16-candlepower carbon lamp into the socket. In a few minutes it will be found that the can becomes so hot that it cannot be touched with the bare hand, but still it is not such a high or dangerous temperature that it would cause anything to be ignited. I have found if this is put under the quilt for a short time it will warm the bed comfortably and very conveniently.

The Relations of the Contractor to His Employees.

By Harvey O. Mercier.

The importance of the existence of pleasant relations between the contractor and his employees is greatly underestimated, if we are to judge by the conditions that prevail in many shops today.

Usually the superintendent visits a job, receives the report of the foreman, reviews the progress that is being accomplished, transacts other necessary business and goes on his way, to repeat the performance perhaps on some other job. This may be all as it should be, because he is acting within the limitations of his sphere. But frequently on a trip of inspection through a building (if a large structure) he meets with some of his firm's workmen and often pauses to observe their actions, but never does he "lower" himself from his high position of authority to the extent of giving an encouraging word or evincing even a passive interest in their welfare.

The foreman generally pursues the same course in his dealings with the men under his direct control. He gives his orders in a curt and not too pleasant manner, never allows a smile to cross his features for fear it may cause him the loss of his dignity and breed familiarity. The average workman has gumption enough about him to resent this treatment and inevitably this causes a feeling of estrangement to exist between employee and employer (perhaps unknown to the employer) as well as a lack of confidence.

Oftentimes when in need of advice on questions of vital importance to the contractor when engaged on a special piece of work, the workman hesitates to seek advice and information from a foreman who is cold and distant, because he feels that very likely he will meet with a cold reception. Because of this he refrains from disturbing the equanimity of the foreman, and decides the question according to his own judgment and in a manner that is often otherwise than planned and sometimes very unsatisfactory.

The underlying cause for this condition seems to be with the contractor himself, for from him the policies of the company emanate, and to him must we look for a remedy. If the contractor can be made to appreciate the value of the friendly co-operation of his employees and the existence of a spirit of confidence and mutual understanding, which can only be brought about through his own efforts, then will he take the initiative to change present conditons. The average contractor does not realize the importance of this question to the successful operation of his business.

A little thought and consideration on the part of the contractor toward the betterment of conditions in this respect can produce but one result, and that is the alleviation of the present frequently strained relations between the contractor and his employees.

Salem Hospital Has Modern Electrical Equipment.

An interesting electrical installation is being made for the new Salem Hospital at Salem, Mass., which is now under construction, the Barnes-Pope Electric Company, Boston, being the electrical contractor. This fine hospital plant, which will cost over $1,000,000, is to consist of an administration building, a domestic building, an operating and surgical building, and a power house. All the buildings are being connected by a tunnel in which are run the electric cables and heating and water pipes.

Though the plant is being built with provision for a local steam generating station, energy is to be procured, for the present at least, from the Salem Electric Lighting Company. Transformers of about 75 kilowatts for lighting and 50 kilowatts for power are located just outside the steam power station, which is to be used principally to provide heating for the entire group of buildings.

The principal electrical features consist of the following: Lighting system, electric elevators, electric heating apparatus for sterilizing and for cooking in the diet kitchen; two telephone systems, doctors' call, nurses' call and bell signal systems and a fire-alarm system.

Construction is first-class throughout, all wires being inclosed in iron pipe laid in the concrete floors. The lighting is by semi-indirect ceiling fixtures and wall brackets. A number of type C Mazda lamps are installed in the larger rooms. The ground and driveways are lighted by means of 100-watt Mazda units on iron poles, connection being with a special BXL cable.

The main switchboard for all the electrical energy used is located in the power house. Feeders are run to distributing panels on each floor of the various buildings. Three-phase, 220-volt energy is supplied to the motors, and three-wire, single-phase, 110-220-volt energy for lighting.

Construction Features in a Large Plant

Details of Electrical Installation and Features of Electric Light Wiring in Crane Company's Immense Chicago Plant Comprising 27 Buildings—A Typical Example of Modern Practice and Methods

FROM the standpoint of electrical construction, it would be difficult to find an industrial plant that is more typical of modern practice or as thoroughly complete in every respect as the Corwith plant of the Crane Company, in Chicago. Early in 1916 this company moved all of its scattered plants in the Chicago territory into one comprehensive factory group, located on a 160-acre tract near the western boundary of the city. At present 27 buildings, with a floor area of 25 acres have been constructed, although present plans call for the construction of 22 additional buildings, with a combined floor area for the entire group of 50 acres.

The Crane Company is one of the world's largest and oldest manufacturers of valves and pipe fittings, and the entire factory is devoted to the manufacture of these products.

All of the buildings of the Corwith group are of skeleton steel, with reinforced concrete floors and concrete tile roofs. The standard type of structure is two story with no basement, 500 feet long and 80 feet wide, with a 40-foot court between buildings. An underground service tunnel, containing pipes for water and steam supply, gas, etc., connects all of the various buildings. The investment in the works, including land, buildings, machinery and equipment, when finished as originally laid out, will be approximately $10,000,000.

The electrical installation ranks among the foremost equipments of its kind in the country. There are at present 557 motors installed, ranging from 0.5 horsepower to 50 horsepower, and having a total rating of 6,137 horsepower. The connected lighting load is somewhat in excess of 500 kilowatts. All energy for lighting and power is purchased from the Commonwealth Edison Company. The present transformer installation is made up of five 150-kilovolt-ampere and 29 200-kilovolt-ampere units, totaling 6,550 kilovolt-amperes. The ultimate installation will be approximately three times the size of that now in use.

General Features of Electrical Construction.

A rather complete description of the general features of this plant and the details regarding wiring for power were given in our issue of January 22, 1916. It is intended here to deal particularly with wiring for electric light. However, in order to convey an idea as to the completeness of the installation it will be necessary to review briefly some of the general features of the electrical distribution system.

As already stated, all energy for light and power is supplied by the Commonwealth Edison Company. Three direct power lines, two from the Quarry Street distributing station of the Edison Company and one direct from the Troy Street substation supply the plant. There is a Crane substation for each group of buildings, two central substations or distributing stations for high-tension energy, which is distributed to two substations at the south end of the property and one at the north end. There are two lines conecting each of these substations, one being used in case of breakdown to the main line, or for other emergency. The two main distributing substations, which are designated by the Crane Company as C2 and D2, respectively, are tied together with a tieline for emergency purposes. The high-tension supply is received at a pressure of 12,000 volts and stepped down to 240 volts, which is the working pressure of the plant.

The high-tension feeders entering the two distributing

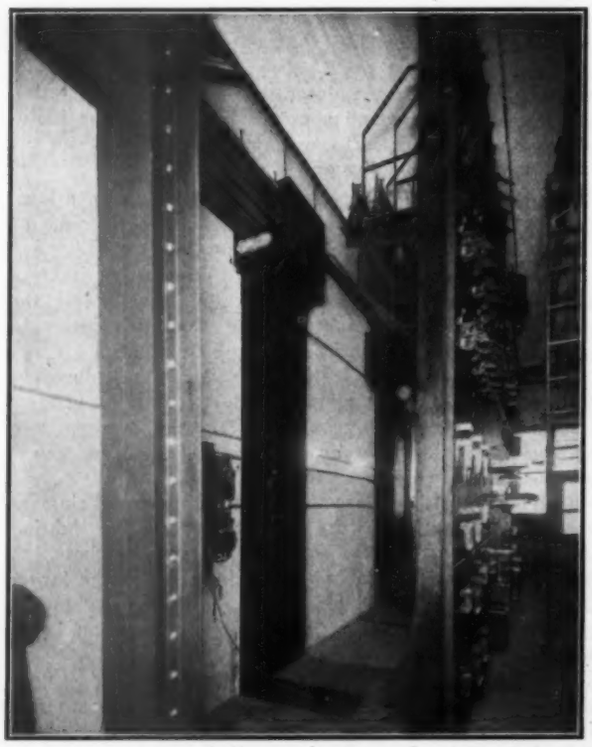


Fig. 1.—Side View of Lighting Switchboard Showing Runways for Wiring.

A Typical 30-Circuit Panel Box Used for Controlling Lighting Circuits.

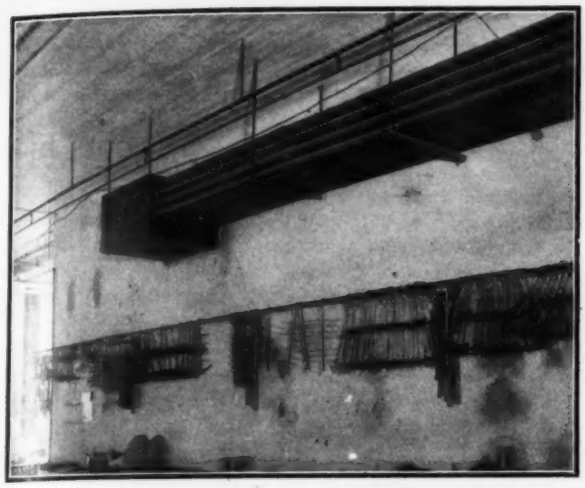


Fig. 3.—A Run of Conduit Leaving Substation.

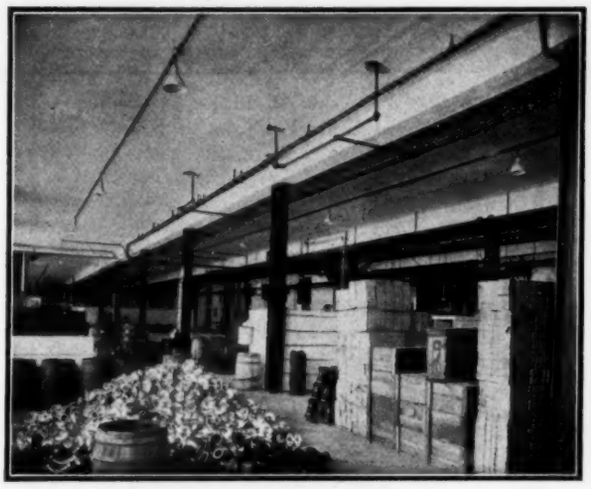


Fig. 5.—Lighting Equipment in a Typical Warehouse.

stations are operated through disconnecting switches and remote-control switches, then through another disconnecting switch to the bus, which is operated by two sectionalizing switches where the lighting load is tapped. This arrangement permits the lighting load served by any substation to be supplied by either of the incoming lines.

All high-tension cables on the property are carried underground through single cement ducts laid six wide and four high in the main run. A varying smaller number of ducts of the same material are installed in the branch runs.

A brief description of a typical substation will serve to convey an idea of the elaborate preparations which were made at the Crane plant to insure continuity of service and satisfactory operation under all conditions. The station designated by the company as C2 is best adapted for description, as it is at present serving the largest group of shops, and represents to a certain degree the ultimate development in the other stations. Each substation is composed of two parts, the transformer room and a switchboard room. The former is a separate building erected adjacent to the main building, and containing the Commonwealth Edison transformers and incoming oil switches,

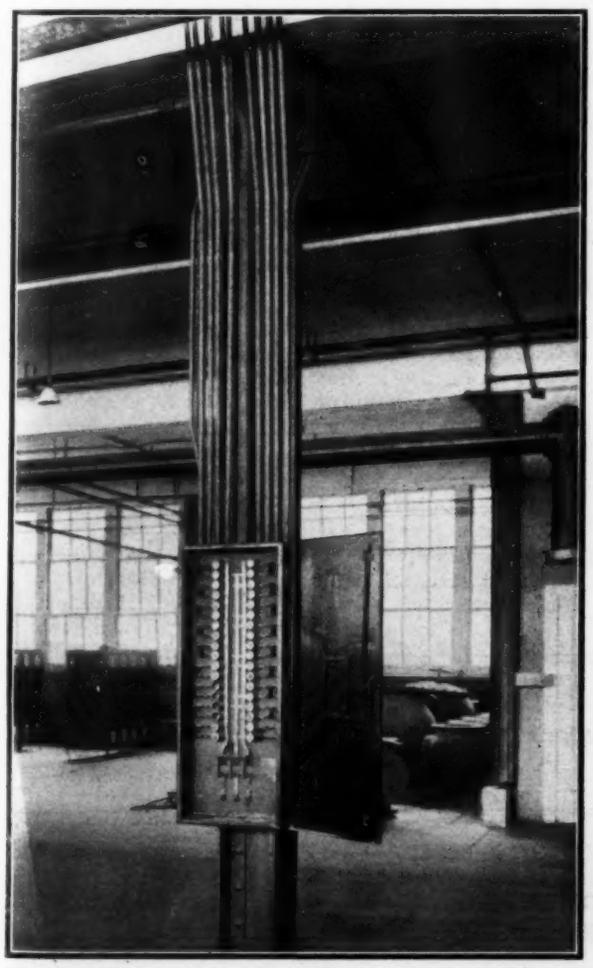


Fig. 4.—Typical Lighting-Circuit Panel Box in Crane Plant.

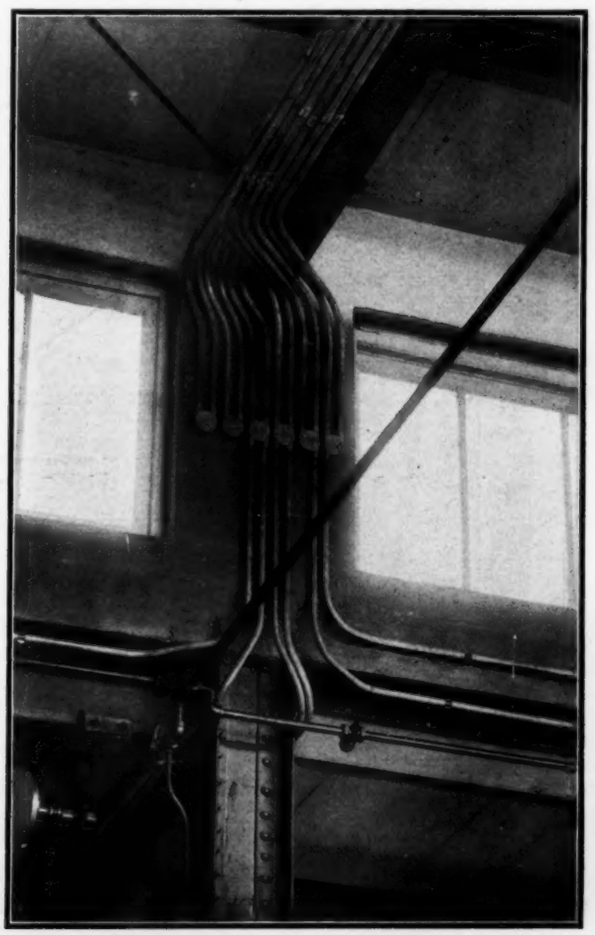


Fig. 5.—Method of Terminating Extra Conduit in Adaptiboxes.

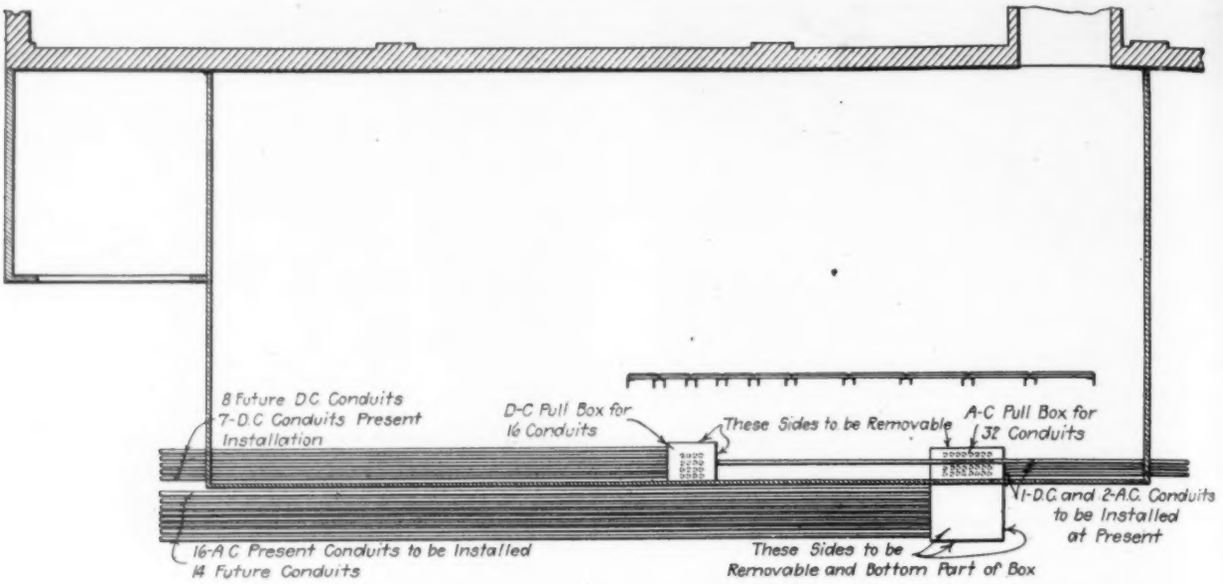

8 Future D.C. Conduits
7-D.C. Conduits Present Installation
D-C Pull Box for 16 Conduits
These Sides to be Removable
A-C Pull Box for 32 Conduits
1-D.C. and 2-A.C. Conduits to be Installed at Present
16-A.C. Present Conduits to be Installed
14 Future Conduits
These Sides to be Removable and Bottom Part of Box

Fig. 7.—Plan of Typical Crane Company Substation Showing Lighting Switchboard and Conduit Arrangement.

etc. The switchboard room is in the main building, and contains the power switchboard on one side and the lighting switchboard on the other, with a motor-generator set at one end for elevator and crane service.

Fig. 7 shows in diagrammatic form a typical substation with the lighting switchboard indicated and the location of conduits for lighting circuits. Fig. 3 shows a run of conduit for lighting service leaving the substation, and illustrates the method employed for suspending from the ceiling.

The main buses from the transformers run through an overhead concrete duct, which connects the transformer room with the switchboard room, the space between the two buildings being approximately 12 feet. Each bank of transformers is connected to a separate bus on the back of the switchboard, these buses being in turn connected in parallel under normal conditions. In any transformer fails its bank can be tripped out and the entire load immediately thrown onto the good bank from the switchboard room by operating an oil switch, which segregates the two buses.

Because of the limited space back of the switchboards a rather unusual method had to be adopted for mounting the buses. Steel gusset plates are bolted to the angle-iron framework of the switchboard, and the busbar supports are clamped to each in such manner that the distance between busbars has been reduced to a minimum. About 15 gusset plates are used, the supports being staggered on each. All busbar supports and insulators at the Crane plant were supplied by the General Devices & Fittings Company, Chicago.

Wiring for Electric Light.

All wiring from the lighting switchboard is carried in compartments formed by the angle-irons which support

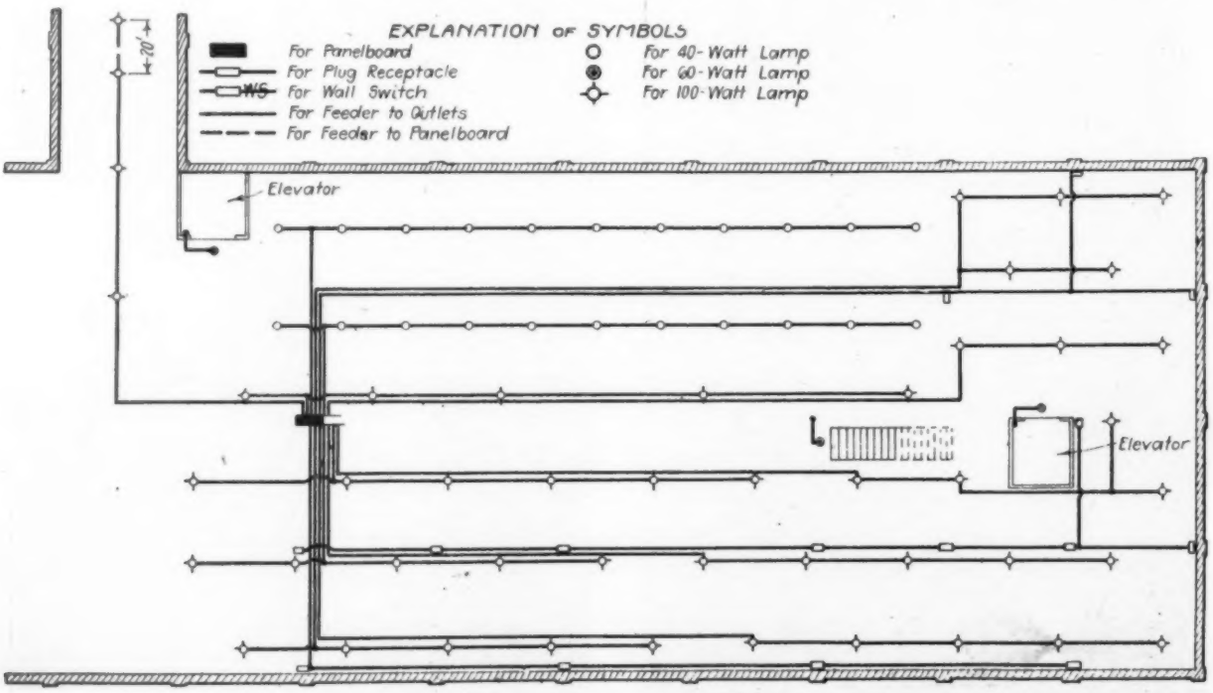


Fig. 8.—Plan of a Typical Building Showing Arrangement of Lighting Circuits and Location of Units.

the switchboard to a pull box on the ceiling back of the board where the conduits terminate. The buses from the lighting transformers run through the same overhead duct as the power buses, and each transformer carries one-half of the lighting load. The lighting switchboard is located along the east wall of the station, opposite from the power board. The typical switchboard is of black Munson slate of 10 panels, comprising two incoming line panels of 1,000 amperes each, one totalizing meter panel containing watt-hour meters and maximum-demand indicators, and feeder panels which contain a circuit-breaker for protecting distribution boxes for lighting service. Fig. 1 shows a side view of the lighting switchboard and the steel runways for lighting leads leading from the switchboard to the pull box near the ceiling.

Details of Conduit System.

The conduit system in the Crane plant required about 37 miles of pipe for the present installation. The lighting conduits, furnished by the Western Conduit Company, are carried largely on the ceiling, and extensive use is made of Adaptiboxes in turning corners and for connecting with branch circuits. Adaptiboxes are also extensively used for terminating extra runs of conduit pending subsequent extensions. A view of this practice is shown in Fig. 6. There are in all about 70,000 Adaptiboxes used in the Crane plant. The conduit for lighting circuits is of one-half inch size throughout the plant. The conduit runs follow standard practice. The supports are formed by 0.75-inch bolts, secured to the ceiling by means of Diamond expansion shields. The conduit is run about one foot from the ceiling, to permit of future extensions without changing the hanger. Minerallac clips are used throughout for supporting runs of conduit.

Fig. 4 shows a typical panel box used in the Crane plant, the average number of lighting circuits controlled being 24. In some few cases 30 circuits are controlled from a panel box, as shown in Fig. 2. Boxes are of Cuthbert manufacture, the panels being supplied by the General Electric Company. All lighting circuits are protected by 10-ampere fuses.

The Lighting Installation.

The lighting installation comprises 500 kilowatts, gas-filled incandescent lamps being used exclusively. With but few exceptions general lighting from ceiling-suspended units is relied upon entirely, exceptions being where localized lighting is needed for a few machines used for very accurate work.

The 100-watt type C lamp has been adopted as standard throughout the plant, except in the receiving building, where overhead cranes are used, and the distance from floor to roof, therefore, considerably greater than in other buildings. Here lamps of 750 and 1,000-watt size are employed. Deep-bowl 10.5-inch and flat-bowl 14-inch white-enameled steel reflectors of Holophane and Harter manufacture are used for all shop lighting. Lamps are uniformly spaced on 17-foot centers in warehouses, and on 13-foot centers in machine shops. There is an average of about 0.6 watt per square foot of floor area throughout.

The lighting in the office buildings is the same as for shops, except that Holophane glass reflectors are used. Spacing of units is uniform, on 20-foot centers. The drafting rooms are provided with indirect lighting, lamps of 750-watt size being used, and a slightly higher intensity secured than in other offices. There is no localized lighting whatever in any of the offices. For corridor lighting 40 and 60-watt lamps are used.

It is realized that a lighting installation of this character must receive attention in the way of periodic inspection and cleaning if its efficiency is to be maintained. A staff of six lamp cleaners is maintained at the Crane plant for this purpose, and very satisfactory results are, therefore, secured.

Fig. 5 shows a section of a typical building lighted by means of 100-watt lamps installed in deep-bowl steel reflectors. Lamps here are installed on 20-foot centers. Fig. 8 is a circuit diagram of a typical office building, showing the spacings and location of lamps and fittings. There are a few 40 and 60-watt lamps used in sections of the office not now in active use, and to supplement the general lighting in some instances.

The entire electrical installation at the Crane plant was designed by and installed under the supervision of Harry S. Stewart, chief electrician.

Efficiency in Switchboard Assembling.

By J. B. Reid.

In assembling switchboards considerable time and labor can be saved by using a portable electric buffing wheel instead of buffing by hand. For instance, in assembling copper busbars I find that it is more efficient to give the final finish to the copper before clamping the bars together, and for this purpose I use a small portable motor with buffing wheel attached. This gives a fine finish and saves a lot of money in installing a board.

Reducing Accidents and Improving Efficiency.

Accidents can be reduced and at the same time the work can be done more quickly by the method indicated in the accompanying illustration, showing how one electric company loads transformers on its delivery wagons.

A heavy frame made of the tops of old poles has been erected in the yard back of the office. The transformers are stored under an adjoining shed. When a transformer is needed the wagon is placed under the frame and by means of a block and tackle the work is done quickly and with perfect safety. A study of accident records will show numbers of internal injuries due to men lifting heavy material, such as transformers, which could be avoided by measures such as these.

It is Possible to Reduce Accidents by the Proper Handling of Transformers.

An Easy Method for Opening Fixture Chains.

By Walter Morris.

In the issue of December 16, 1916, there was a kink on the change in length of fixture chain when the wireman has forgotten to carry two pliers along with him. I found that it is not always necessary to use two pliers and that

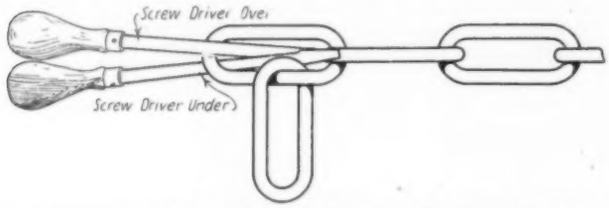


Fig. 1.—Opening Fixture Chain by Means of Two Screw Drivers.

the method shown in Fig. 1, using two screw drivers as indicated, will open a link if the tools are manipulated carefully and this without scratching it. Put one screw driver through the loop directly under the joint and the other one directly over the other side of the joint. By pressing in opposite directions on the screw drivers the loop will open easily. To close it reverse the two screw drivers.

Another way to accomplish this is by using one pair of pliers and one screw driver, the pliers holding one side of

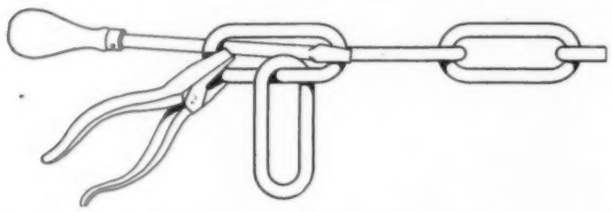


Fig. 2.—Opening Fixture Chain by Means of One Screw Driver and Pliers.

the joint while the screw driver is used to pry up or down the other side. In this case to close the joint, reverse the screw driver. When using pliers on fixture chain, it is necessary, of course, to use either a smooth-jaw plier or to put some protection around the link to prevent its being scratched by the usual rough edges of the pliers.

Among the Contractors.

Gustaf Peterson has opened an electrical store and will do contracting at Stoughton, Wis.

Gorham Brothers have established an electric shop in Antigo, Wis., and will handle supplies and do contract work.

The Arizona Electric Appliances Company has been organized in Jerome, Ariz., by T. J. Perry, E. C. Paine and F. W. Zimmerman.

Charles A. Huse, Morrisville, Pa., has opened an electrical repair shop in the building formerly occupied by E. R. Smith Wagon Works.

C. A. Renard, of Los Angeles, Cal., received the contract for installing ornamental lamps on Hobart Boulevard, in that city, on his bid of $1,930.

George Bell, for several years manager of the Natwick Electric Company's branch office in Stevens Point, Wis., has purchased the electric shop in that city conducted by C. E. Nebel for J. A. Staub, of Grand Rapids, for the past two years.

Frany B. Nissley, Lancaster, Pa., has received the contract for the installation of electrical work and fixtures at the new Young Women's Christian Association building, Lancaster. The structure is estimated to cost $100,000.

The Pacific Lamp & Supply Company, Seattle, Wash., received the contract for 450,950 electric lamps for the use of the Seattle Department of Public Works for 1917. The contract was awarded on a bid of $100,000.

Nimis & Nimis, Inc., West New York, N. J., has been awarded a contract for the complete installation of electric wiring and lighting system at the ice storage plant of the New York Central Railroad, Weehawken terminal, N. J.

The Denton Engineering Company, Kansas City, Mo., was awarded the contract to install a light and power plant and the wiring in the new Aines Farm Dairy Company building in that city. The job amounts to about $3,400.

John W. Hooley, Jersey City, N. J., has been awarded the contract for the installation of conduits, wiring and fixtures for power and lighting in the new building of the Davis-Bournonville Company, Broadway, Jersey City, manufacturers of oxy-acetylene welding and cutting apparatus.

The Newberry Electric Company, Kansas City, Mo., has the contract for installing the wiring for lighting and power in an eight-story building at Tulsa, Okla., for the Sinclair Oil & Gas Company. The job will amount to $12,000, including the installation of two 75-kilowatt motor-generator sets.

The Electrical Supply Company, of Sacramento, Cal., has been awarded the contract for the installation of the electroliers to be placed in front of the Sacramento court house, on its bid of $3,565. J. C. Dolan received the contract for the lighting fixtures for the nurses' home and surgical ward at the County Hospital, his bid for the installation being $978.

The Independence Electric Company, H. A. Esler, manager, is opening headquarters in Kansas City, Mo., at 1417-1419 Walnut Street, and will close its stores in Independence, Mo. The company had begun as a contracting company, but of recent years had developed its wholesale business in wiring supplies to contractors to such an extent that it has now turned altogether to this line. It has salesmen on the road now, and will add more. Independence is nine miles from Kansas City; railroad facilities for shipping were inadequate there. The company will have two floors, each 50 by 115 feet. It does no retail business, and is said to be the only jobbing company in the city that confines itself entirely to the wholesaling business.

Wisconsin Contractors Elect Officers.

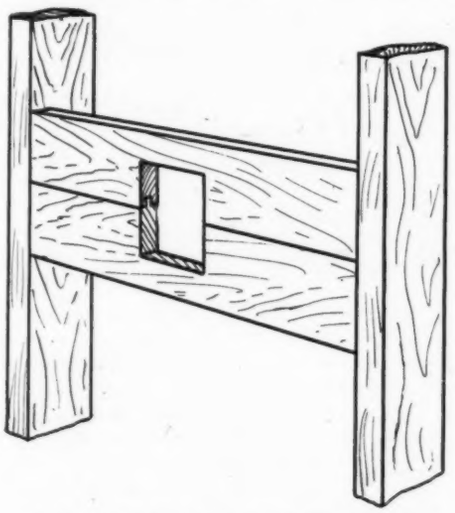
At the closing business session of the fourteenth annual convention of the Electrical Contractors' Association of Wisconsin, held in Milwaukee, January 15-17, officers for the ensuing year were elected as follows: President, Paul Honold, Sheboygan; vice-president, A. M. Kailing, Milwaukee; treasurer, H. F. Trester, Milwaukee; secretary, J. C. Staff, Milwaukee; directors: R. J. Nickles and P. F. Harloff, Madison, the latter being elected representative to the National Electrical Contractors' Association. In order to secure greater co-operation it was decided to hold meetings of the association four times a year, the annual meeting to be held in Milwaukee, and others in other cities of the state.

DOLLAR WIRING KINKS

All readers are invited to contribute to this department. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must be new and bright. A dollar will be sent to the contributor upon publication.

Mounting Switch Boxes in a Rigid Manner.

It is quite a common custom for wiremen to install switch or other wall boxes that are held only by the lath. In putting in flush switches in new houses I have found the following the best way for setting the boxes. It allows the lather to fix the lath solid all around the box and makes a strong and rigid wall when plastered over. There are always some pieces of flooring lying around a new house. I take two of these pieces and cut them to the correct length to fit between the studs. I place them together, matching the tongue and groove. Next I lay the switch box on them, marking off the



Providing for Wall Boxes in New Buildings.

hole that is to be cut, this being directly over the joint between the two boards. I then separate the boards again and cut the hole with an ordinary saw. The boards are then nailed in place and the box set. I find this to be by all odds the most solid method of mounting the box and it requires very little more time than the ordinary method.

J. E. Randle.

Saving Labor in Drilling Slate.

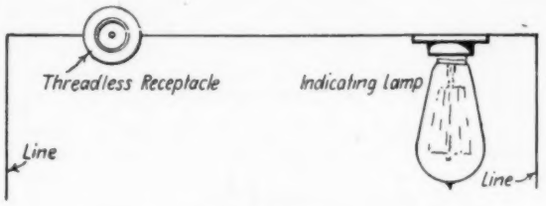
When drilling large holes in slate or metal, I find that much labor and time can be saved if a small drill is used first. This is particularly true with holes as large as one or one and one-fourth inches. In the case of holes of the latter size, I employ a No. 29 drill which will make a hole almost large enough to give the center of the large drill clearance; this center measures one-eighth inch, so it is easy to see where the labor is saved. This scheme also insures that the hole will be drilled at the desired center mark and that the large drill will not wabble off to one side as so often is the case.

George R. Strombom.

Convenient Plug Fuse and Lamp Tester.

A quick, convenient and therefore efficient fuse and lamp tester may be made by removing from a cleat receptacle the metal shell which contains the threads, and hammering them out; this may be done by slipping it over the end of a piece of one-half-inch pipe and hammering on the threads. Then replace and connect in series with a lamp, as shown in the diagram.

By inserting the lamp or plug fuse to be tested into this



Convenient Plug-Fuse and Lamp Tester.

threadless receptacle contact is made on the end and side, and if the fuse is not blown or the filament of the lamp not broken the indicating lamp will light. Ralph O. Bates.

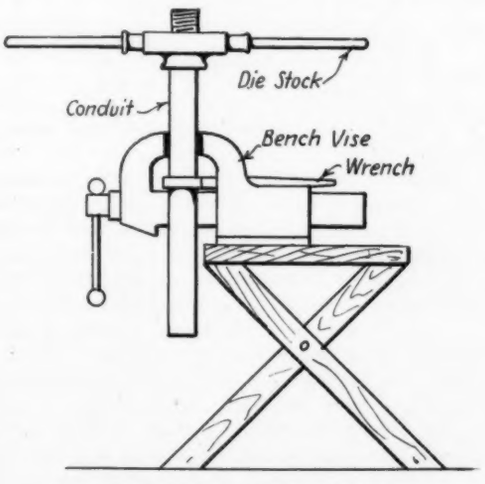
Fishing for a Wall Switch in Cramped Quarters.

Recently I had occasion to fish for a switch in a wall that had the roof very close to it. I was unable to get the fish chain clear down; it would stop at the same place about four feet down every time and there was no way of helping the difficulty from above. I saw that there evidently was an obstruction between the studs. I already had cut a hole for the switch box. Having a six-foot rule with me, I opened it, one section at a time, and pushed it into the hole that I had bored in the plate. At about four feet it struck the obstacle and by moving the rule up and down I soon managed to knock the plaster away from the piece between the studs. I then tied the chain to the rule and let it down, fishing both rule and chain out at the hole cut for the switch box. This is the only way that I have found to solve this problem without disturbing the plastered wall.

J. E. Randle.

Using Common Bench Vise as a Pipe Vise.

It is frequently necessary to make alterations on conduit work, involving cutting and threading of pipe, in a place where there is no pipe vise at hand, but where an ordinary bench vise can be used. The latter can be readily adapted for use as a pipe vise in the manner shown in the sketch. The conduit or pipe to be threaded can be firmly held from turning



Common Bench Vise Used as Pipe Vise.

by means of a pipe wrench placed below the jaws of the vise so it can take a strong hold of the conduit. The wrench rests on the horizontal sliding stem of the vise and is braced against the back part of the vise, thus being held firmly in place.

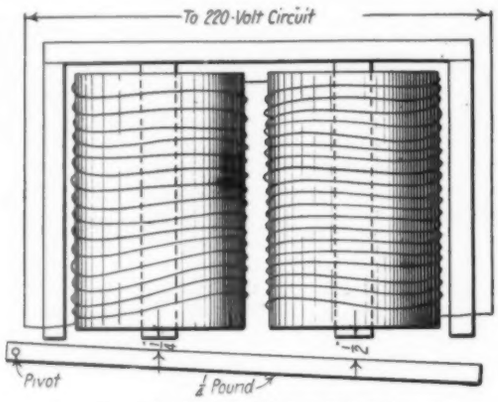
K. F. Kelly.

QUESTIONS-ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions may relate to electrical matters of any kind. Answers contributed by readers should be submitted preferably within eight days of the date of publication of the question and should be limited, if possible, to 300 words. Payment will be made for all answers accepted and published.

Questions.

No. 380.—Design for Relay Coil.—I would like to secure data on the winding of a relay coil for use on a 220-volt direct-current circuit. The general arrangement of the coil is shown in the accompanying sketch. The coil must lift a one-fourth-pound armature through a distance of one-half inch at the further core and one-fourth inch at the nearer core. This lift



No. 380.—Winding for Relay Coil.

must be made quickly as the relay is on a signaling device. There is to be no current on this coil for more than a second at a time. What size of wire and how many turns should be used for each half of the coil? About what size of cores and yoke should be used?—R. S., Dayton, O.

No. 381.—Ventilation of Flush Ceiling Fixtures.—Is it reasonable to insist on special ventilation upward in the case of a 100-watt fixture depressed flush in the ceiling? A series of these fixtures with glass bottoms is set into the ceiling under a balcony of a theater where there is limited headroom. There is a small ventilating clearance between the sides of the fixture and the frame for the glass bottom, but the inspector insists that a ventilating duct be run upward.—V. S. C., Buffalo, N. Y.

Answers.

No. 372.—Electrolytic Rectifier.—I should like to have given the general specifications of a 100-watt, 110-volt, electrolytic rectifier of the carbon and aluminum type.—H. N., Chicago, Ill.

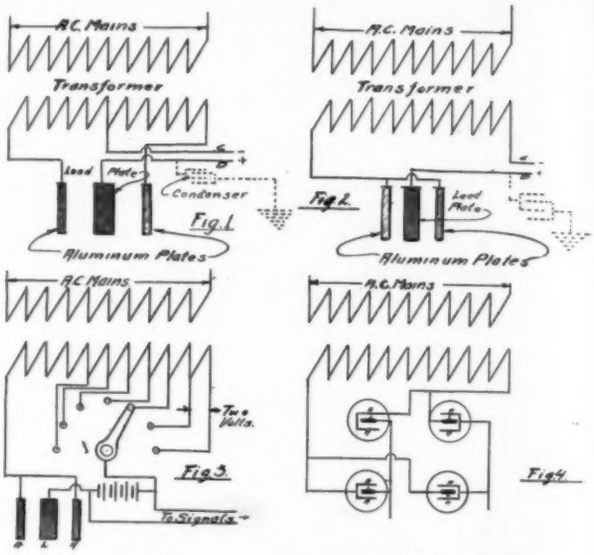
For a 100-watt rectifier one (or four) three-gallon earthenware or glass jars will be required. Covers of wood or fiber should be made to support the terminals. Two rods or plates of aluminum connected together with a jumper form one terminal and a plate of iron, platinum, carbon or lead the other; lead is preferred. As the lead plate is always the anode it will be gradually decomposed owing to electrolysis and should be made so as to be easily changed.

Although theoretically a transformer is not necessary, it is safer practice to insert one between the primary and secondary circuits. If direct current of 110 volts is desired and the primary current is 110 volts, a transformer with a 1 : 2 ratio is necessary for the reason that one-half of the winding is at all times dead.

The current in the load circuit will be pulsating and consist of succeeding positive impulses. In charging storage batteries, between impulses current from the battery will have a tendency to flow back through the rectifier, although the current is sufficiently continuous to serve as direct current. The gaps between successive impulses may be filled in by inserting a one-microfarad condenser between load circuit and ground, or four jars may be used as in Fig. 4.

The best solution to use is two pounds of microcosmic salts (sodium-ammonium phosphate) per gallon of distilled water. Aluminum hydroxide and ordinary sal-ammoniac, as used in the Leclanche cell may also be used. The density of the solution should be 1.150. Potassium phosphate may be added to secure the desired density, although this will hasten the decomposition of the aluminum electrodes.

Figs. 1 and 2 show two different connections and Fig. 3 is a diagram of an adjustable-voltage set which has been in suc-



No. 372.—Circuits for Electrolytic Rectifier.

cessful operation for some time. Fig. 4 shows a more elaborate set for complete rectification.

When a rectifier is first put in operation it may be found that it will not operate. The plates must first be put through a forming process. This can be affected by connecting through a resistance to the alternating-current mains and gradually cutting out the resistance.—J. J. S., Chicago, Ill.

No. 377.—Electrolytic Action on Teeth.—Is there any basis for the assertion that when a person has several tooth cavities filled with different metals, say some with "amalgam" and others with gold, there is likely to be rapid decay of the teeth due to the electrolytic action between these different metals? I have heard this statement made positively by some dentists and flatly denied by others.—L. F. B., Waukesha, Wis.

Such action depends entirely on how the "amalgam" is made. If the mixture is thorough, there is no reason for it to disintegrate. Where electrolysis has occurred it may be safely said that the mercury in the amalgam was not properly incorporated in the mass. I have one tooth that is filled with gold and with amalgam; so close were the cavaties that the two metals touch. Before the amalgam filling was placed, the dentist told me that the tooth was not strong enough to warrant filling with gold but, on the other hand, he was afraid to fill with amalgam on account of electrolysis. To discover, if possible, and to prevent electrolytic action we experimented with voltaic piles made of gold and amalgam with blotters wet with sodium chloride and later with acetic acid. There was not a measureable electromotive force where the amalgam had been properly made.

Where the amalgam is not made properly, further chemical action, not electrolysis, causes the distintegration of the tooth filling. Even a poorly made amalgam filling will last four to six months, if the tooth does not decay around it. Cleaning the mouth thoroughly once a day will keep the teeth clean enough to prevent decay. In the so-called electrolysis cases the cause is generally decay around the filling or chemical action

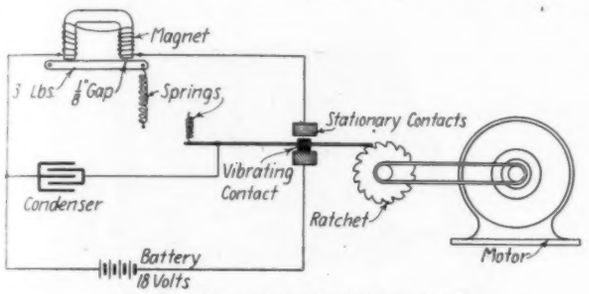
in the filling which latter would occur regardless of whether the gold was adjacent or not.—H. E. W., Chicago, Ill.

No. 378.—Removing Frosting from Lamp Bulbs.—I have a large number of frosted lamps on hand and would like to know whether there is any method of removing the frosting from the glass bulbs.—J. B. B., Warren, R. I.

If the lamps are not frosted by a sand blast, acid frost or waterproof frosting, dip them in wood alcohol and rub thoroughly with cheese cloth until dry. Repeat the operation until the lamp is left quite clear.—A. J. T., Mosinee, Wis.

Frosting may be removed best with carbon tetrachloride, provided it is not a permanent etching of the glass bulb. This material may be obtained from any druggist or clothes-cleaning establishment doing dry or French cleaning. If these places do not have it at the time, buy a cleaning fluid from your dealer called by the trade name "Carbona," which is nothing more or less than carbon tetrachloride.—H. E. Weightman, Chicago, Ill.

No. 379.—Special Condenser.—I have a strip condenser made of three strips of paper and two of tin foil 3.5 inches wide and arranged alternately, all being rolled together. I have about 10 feet length of this and wish to use it in connection with the apparatus illustrated. This includes an electromagnet with 240 turns of No. 21 B. & S. wire wound on a core one-fourth inch in diameter and 2.5 inches long. The magnet must lift or vibrate an iron armature against a force of three pounds,



No. 379.—Circuit for Special Condenser.

including its weight, through a distance of one-eighth inch. The current is pulsating about 100 times a second, a ratchet wheel governing the vibrating contact maker as shown. When this contact is down the 18-volt storage battery charges the condenser. When this contact is up the condenser discharges through the magnet and pulls up its armature. I wish to know how long a strip of the condenser should be wound up so that it will store enough energy to cause the magnet to vibrate its armature.—C. B., New York, N. Y.

The scheme is not practicable as outlined above. In the first place, the magnet will not pick up its armature with a three-pound drag, if made as the above specification indicates. The coil would burn out for one reason. Assuming, however, that the coil will pick up without undue heating, then, to furnish the proper amount of energy, the condenser would have to be somewhat better than six farads. It is quite obvious that ten feet of condenser wrapping such as described would not equal such a figure. To be operative the coil must have greater current-carrying capacity and the combined circuit must be of low time constant and a sufficient electromotive force must be used.—H. E. W., Chicago, Ill.

BOOK REVIEWS

"Government Telephones." By James Mavor, Ph.D., New York: Moffat, Yard & Company. Cloth, 176 pages (5x7½ inches). Supplied by Electrical Review Publishing Company, Inc. for $1.

This book is an interesting record of the management by the government of the telephone system in Manitoba, Canada. An account is given of the early telephone development under private enterprise, and the final acquisition of the Bell system by the government, and the political and unbusinesslike methods which followed. Fictitious profits, which were first in evidence in the government's reports, soon disappeared, however, and there was an aggregate loss in four years of over $300,000. A quotation from the *Manitoba Free Press,* at Winnipeg, from an interview with a high official of the government telephone system (name not given), at the time of an election, states: "Some of my men have been working practically night and day during the past three weeks, and a great sigh of relief will go up from every telephone man when the elections are over. Several extra gangs were put on to get the good will of the people, and in one district we have no less than forty-two gangs working, each one of which is composed of from twenty-five to thirty-five men. The whole thing is one huge political graft, and we who are rushed to death are heartily sick of it." The same journal, speaking editorially, says: "Complaints of the unsatisfactoriness of the telephone service are constant. The commissioners have to do what the politicians in power want done. The result is that the system is loaded with employees appointed for political reasons." For the year ending November 30, 1915, as analyzed in the book, there was a deficit of $97,629. The author of "Government Telephones" reaches the following conclusion: "The entire history of the government telephone enterprise in Manitoba affords evidence of the most positive character against government ownership. The management has been uneconomical; the enterprise has been handicapped by political intrigue; the finances, mingled as they have been with the general finances of the Province, have been unsoundly administered from the beginning, and the obligations of the public have been enormously increased without adequate compensatory advantages. It is possible that only by repeated and costly failures such as the Manitoba government telephones, will the public realize that the proper function of the government is not the conduct of industries, but the impartial inspection of them under intelligent laws adapted to the character and conditions of the community and the country."

"Alternating Currents." By H. R. Kempe, New York: D. Appleton and Company. Cloth, 83 pages (5x7 inches), 25 diagrams. Supplied by the Electrical Review Publishing Company, Inc.

As one compares this eighty-page booklet with some of the standard texts on alternating currents, he begins to wonder what the author had in mind in publishing it. An examination of the preface discloses the fact that it is a compilation of "Some notes which the author had made from time to time on certain problems and in reference to which he had been unable to find sufficient explanations."

After an examination of the notes one again wonders what authorities or sources were searched for explanations, for it is not difficult to find much fuller discussions than given in the text.

The book contains nine short chapters on such subjects as the following: Flow of direct current in a circuit containing resistance and a counter electromotive force, alternating currents and inductance and capacity, effect of angle of lag, joint resistance, elementary combinations of resistance, inductance and capacity, telephonic transmission, and instrumental measurement of an alternating current.

The book is lacking in clear explanations of fundamental principles to be of much value to anyone not already well acquainted with the theory of alternating currents. Some originality is shown in the development of the formulas, but the attempts to avoid higher mathematics does not simplify nor clarify the discussion.

Practically no definitions are given, and when one realizes the necessity for definiteness in the use of words he is surprised to find little distinction made between resistance, reactance and impedance. Inductance is represented by L and also by fL. The longest and best chapter in the book is on telephone transmission.

C. M. Jansky.

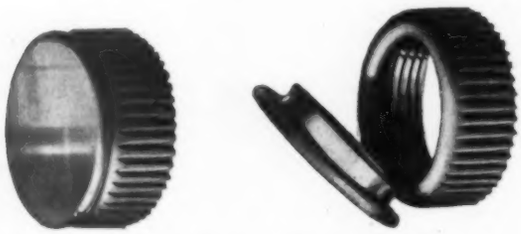
NEW APPLIANCES

A Review of the Latest Developments and Information Respecting Electrical and Kindred Mechanical Appliances

The Detroit Closed Bushing to Prevent Conduits Being Clogged.

Electrical contractors in the past have had much trouble and annoyance from conduit becoming plugged and filled during the period of construction, particularly in reinforced-concrete buildings. This often has necessitated the tearing up of a floor, or the cutting and marring of finished walls to replace the stopped-up piece of conduit, through which it has been unable to pull wires.

The principle of the Detroit closed bushing illustrated herewith is simple and practical. It absolutely insures clean and unobstructed conduit wherever used. The top



Simple and Practical Conduit Bushing.

comes securely fastened into the bushing, but it can be readily removed by the wireman with a screw driver or pliers. The protective feature of this bushing leaves nothing to the memory of the workman, as he must bush the conduit to complete the conduit installation, and when he has put on this bushing, he thereby closes the end of the conduit.

It is obvious, therefore, that the Detroit closed bushing is in reality a foolproof safety device, which accounts for its warm reception by electrical contractors as a time-saving and money-making investment, and by the progressive architect as a sure protection against the danger of destructive conduit replacements and eliminates the delays caused from these replacements, when the building is approaching completion, and the owner is pushing him for occupancy of his building.

These bushings are made by the Detroit Closed Bushing Company, Incorporated, Kresge Building, Detroit, Mich.

New Converter for Changing Alternating Into Direct Current.

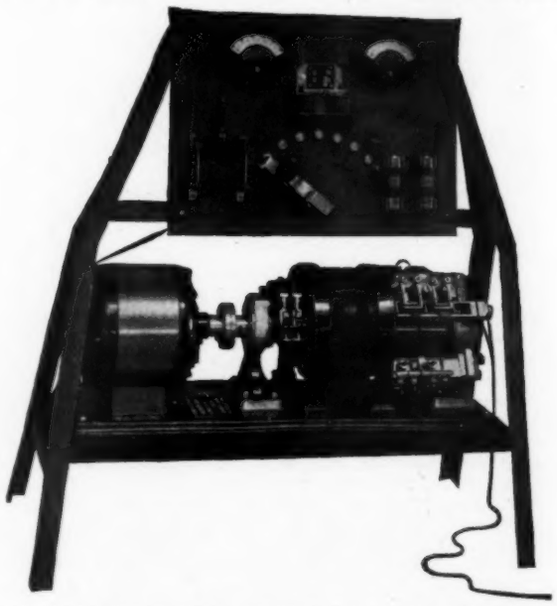
A new converter for changing alternating current into direct current has been placed on the market under the trade name "The Little Giant Converter." It is operated very easily. All that is required is to connect the machine to the alternating-current line, attach the load, turn the handle on the front of the switchboard or control panel, to the number corresponding to the number of storage-battery cells to be charged, and close the main switch.

A transformer is mounted on the main shaft in front of the commutator. The voltage is stepped down by means of the transformer; the current is then led into the rotating part and commutated. It is not a reversing commutator machine and has none of the inherent defects of such outfits, it is claimed.

A very small synchronous motor is used to drive the shaft, which runs on ball bearings; consequently the efficiency is very high. The converter is much lighter than other apparatus used for similar purposes. The machine shown in the illustration weighs about 150 pounds. It is simple and automatic and is not affected by commercial variations of line voltage, frequency or power-factor.

This converter can be made for any voltage, phase, frequency or capacity. Among the standard ratings are those for charging from 3 to 18 cells, 6 to 36 cells, 24 to 28 cells, and one for a 60-cell capacity.

During a recent demonstration before the Toledo Section of the American Institute of Electrical Engineers, the converter operated a motion-picture machine drawing about 45 amperes, charged a 28-cell electric car at a 35-ampere rate and ran a two-horsepower direct-current motor at the same time. On the same test the machine was short-circuited by bringing the two ends of the direct-current line together and allowing it to run for 15 minutes without being affected injuriously.

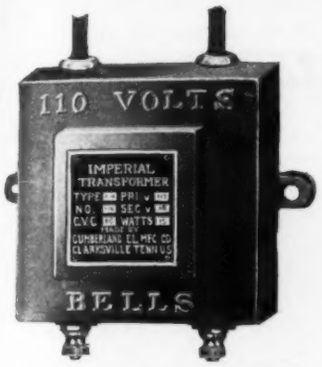


New Converter, Feature of Which Is Its Ease of Operation.

This converter is now being manufactured by the Electric Converter Company, Toledo, O. The Little Giant Converter Company, 959 Leader-News Building, Cleveland, O., is the general sales representative of the manufacturer.

New Bell-Ringing Transformers.

A new line of bell-ringing transformers is being placed on the market by the Cumberland Electric Manufacturing Company of Clarksville, Tenn. These are made for general signaling purposes, such as operation of bells, buzzers, alarms, gongs, etc. Several sizes are now available and more are being added. The smallest is 3.25 inches square and 2.25 inches thick, it is for light signaling service, such as in residences, flat buildings, etc. Its capacity is about 20 watts; the secondary voltage is 8, and the primary 110 to 130. This transformer can be furnished for any frequency up to 133 cycles per second. Another transformer of the same dimensions and



New "Imperial" Transformer.

Fig. 1.

Fig. 2.

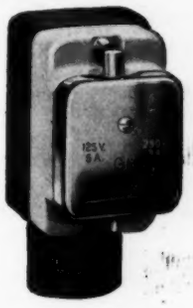


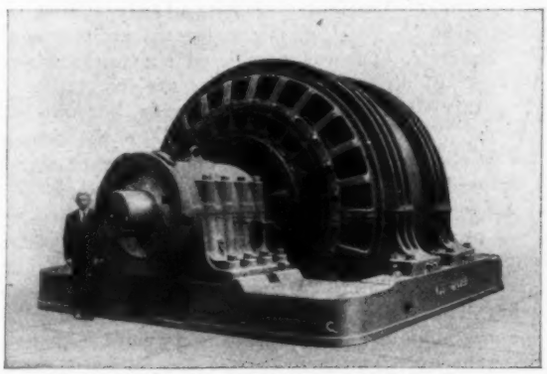
Fig. 3.

weight (about 2.5 pounds) is made for three secondary voltages: 6, 9 and 15; its capacity is 24 watts. For heavier work in factories, hospitals and other larger buildings there is available a 75-watt transformer with three secondary voltages: 6, 14 and 20; this unit can be used in any place where several bells or gongs are likely to be rung at the same time.

The Cumberland company is specializing on transformer manufacture and besides the bell transformers referred to and other types of this line now being developed, is prepared to build transformers to any specifications as to voltage, capacity, etc. All of the company's transformers are well built and guaranteed, and yet sold at a low price.

A Modern Monster—15,000-Horsepower Motor Is Largest Ever Built.

We are told that at one time this old world of ours was inhabited by gigantic monsters. We still have monsters—electrical and mechanical ones—that are far more powerful than any of which our prehistoric ancestors knew. Take, for instance, the Westinghouse reversing motor illus-



The Modern Electrical Monster.

trated, which is designed for driving 35-inch reversing blooming mills in steel plants. When we realize that it has a capacity of 15,000 horsepower, the largest electric motor ever built, we need no further proof, we know it is monstrous. Some idea of its size may be gained when it is stated that the man standing alongside the motor is six feet tall.

Conduit Fittings for Use with C-H Push-Button Switches.

Three new conduit fittings are shown in the accompanying illustrations particularly adapted to C-H push-button snap switches. Fig. 1 shows a No. 7102 surface switch on a rectangular Crouse-Hinds fitting. Fig. 2 shows a No. 7108 round-base switch installed on a standard round conduit fitting. Fig. 3. shows a C-H No. 7105 switch with special base installed on a standard Paiste taplet. The conduit fittings referred to may be used with any metal conduit of corresponding diameter and thread. The fittings are small, with a japanned or galvanized finish to match the finish of the conduit.

The switches have the characteristic C-H push-button operation with a light button for closing the circuit and a dark button to open the circuit. In addition to being used on conduit systems, the switches may also be used on practically all kinds of wiring systems—wooden and metal molding, open wiring and concealed wiring. They are rated at 5 amperes, 125 volts, and 3 amperes, 250 volts, National Electrical Code standard and are made by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Electric Faucet for Furnishing Running Hot Water.

To be able to secure hot running water direct from the faucet is a very great convenience, the lack of which is keenly felt where cold water alone is available. To meet this need there has been placed on the market the "Jiffy thermo-electric faucet," which includes a 660-watt electric heater and is so arranged that it can easily be attached to the plumbing piping and its electric circuit readily connected to the nearest lighting outlet.

This faucet is very simple and automatic in action, the same motion controlling both water and electricity. It supplies hot water within three seconds after it is turned on, furnishing it in a steady stream of about a pint a minute, sufficient for a shave, hot-water bottle, making hot drinks, etc., in fact, for practically all purposes except the bath or laundering where large quantities of water are necessary. It furnishes the water

Thermo-Electric Faucet.

fresh and pure and it is therefore possible to use this faucet for hot-water supply where ordinary tank hot water would not be sufficiently sanitary. Therefore it can be used in the physician's or dentist's office, hospital, nursery, confectioner's shop, etc., as well as in the home and other places where hot water is desired.

The faucet is made of nickel-plated brass so as to present an attractive finish and generally pleasing appearance. The insulation of the electrical part is porcelain. The heating element is always submurged and therefore not likely to be damaged; in fact, the entire outfit is simply but durably made and no part of it should get out of order. It is compact and weighs but little over a pound. It is manufactured by the Thermo-Electric Faucet Company, 74 New Montgomery Street, San Francisco, Cal.

Westinghouse Starting and Lighting Equipment for 1917.

The Westinghouse Electric & Manufacturing Company has developed and is placing on the market for the coming year a complete line of starting motors and generators of the round-frame type. These machines are similar in construction and general appearance to the round-frame type motors built by the company for the past two years and which have proven so satisfactory in meeting the requirements of the trade.

The starting motors are being built in a number of sizes and of such range as to be applicable to engines with a cylinder displacement up to 1,000 cubic inches. With the graduated range in which these motors are built it is possible to select a standard motor for any size engine which will exactly fulfill the requirements and still be the most economical application. The motors are all of the single reduction type and equipped with the Bendix screw shift transmission for meshing with the flywheel gear. While these will be the standard machines, the round-type frame motor equipped with a magnetic pinion shift will be retained and can be supplied as before. For the most economical performance the proper size of battery, a capacity of 80 ampere-hours to 160 ampere-hours, must be used with a given size of motor equipment.

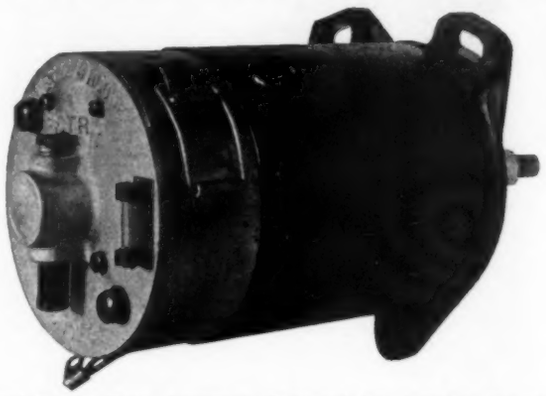
Corresponding sizes of generators are also being built for operation between engine and twice engine crank shaft speed. These machines are of the third brush regulation type, a method which has proven very satisfactory where a large output is desired at low speed and where, at the same time, it must

Generator and Ignition Unit.

maintain the maximum output with reasonable relation to the ampere capacity of the battery. The approximate output of generators varies from 12 amperes maximum at 1,500 revolutions per minute for the smallest machine to 20 amperes maximum at 900 revolutions per minute for the generator of largest size.

In order to simplify the line and obtain the greatest benefit, the company will standardize on the round-frame type construction. While these machines are standard, the rectangular frame magneto shaft height type with the moving contact regulator as an integral part of the machine will still be manufactured.

The simplicity of outline and neat appearance of these motors and generators are shown in the accompanying illustrations. Both generators and motors are designed primarily for bracket



Round-Frame Type Generator Designed for Bracket Mounting.

mounting, the generator on the timing-gear housing and the motor on the flywheel housing. With this type of mounting they can be quickly assembled on the engines and are readily accessible in the finished cars. The mountings are also such that they can be easily standardized. This standardization will mean much not only to the automobile manufacturers, but will mean a great deal also to car owners when the necessity for service arrives.

Motion-Picture Studio Lighted by Gas-Filled Mazda Lamps.

In Los Angeles, Cal., the new electric studio of the Keystone Film Company is one of the sights for the visitor, it being one of the largest motion-picture studios. The building is 80 by 120 feet, is constructed entirely of reinforced concrete, and was completed six weeks after the first shovel of dirt was removed for the foundation. For lighting this studio 646 1,000-watt Mazda Photolite lamps are used. Work is now being rushed on the remainder of the studio in which 600 additional lamps of this type will be used.

Each bank or rack (side and overhead) carries nine lamps and can be tilted at any angle and raised or lowered to any height desired. Each lamp is on an individual circuit and the entire installation is regulated by remote-control switches. These Mazda Photolite lamps are specially suited for photographic use. Each lamp is provided with its own special reflector. The lamps are of the Sunbeam type and with the entire lighting equipment were furnished by the Los Angeles office of the Western Electric Company, incorporated.

Big Increase in Power Demand for Industrial Service at Lancaster.

The Edison Electric Company of Lancaster, Pa., reports an increase in power service for local industrial establishments of 1,276 horsepower during December, making a gain of 4.487 horsepower for this class of service during the year 1916.

This increase is held to be due to the fact that local manufacturers are resorting to central-station service in preference to individual plant operation, affording a decreased cost of operation and assurance of continuous service. The company is now supplying a total of 20,348 horsepower to industries in Lancaster and vicinity.

ACTIVITIES IN THE TRADE

Landers, Frary & Clark, New Britain, Conn., have issued revised list prices on "Universal" electric home needs, effective February 1.

Beardslee Chandelier Manufacturing Company, 216 South Jefferson Street, Chicago, Ill., has issued new list prices, effective January 1, on its "Denzar" lighting fixtures.

H. T. Paiste Company, 3201 Arch Street, Philadelphia, Pa., manufacturer of electrical supplies, has had plans prepared for a new one-story addition to its plant, about 30 by 100 feet, on Thirty-second Street.

The **Naugle Pole & Tie Company** announces the opening of an office at 305 Masonic Temple, Cedar Rapids, Iowa, in charge of J. B. Wilmott. The branch office has been created in order that the company can better serve its customers in that territory.

The **General Scientific Equipment Company,** Philadelphia, Pa., recently incorporated to manufacture thermometers and scientific apparatus, has had plans prepared for a three-story plant to be erected in North Philadelphia, at a cost of about $200,000. Alfred J. Zimmerman and A. J. Leonard are principal stockholders.

Portion of General Electric Shops to Move to Erie.—Announcement is made that the General Electric Company will remove a considerable portion of its railway-motor work from its Lynn (Mass.) plant to that at Erie, Pa. The number of Lynn employees will be little affected, since the work will be replaced by lighter processes of the company's general business.

Lack of Power in Kentucky Coal Fields.—Some of the coal mining operations in the southeastern Kentucky coal fields have been delayed in development on account of lack of power for which they will depend on service of the Kentucky River Power Company. The original plant of this company is now operating to full capacity and finishing touches are being given to the first unit of the new plant so that the requirements of the coal operators in the field can be supplied.

The V. & D. Electric Company of Franklin, Ohio, has entered into license agreement with the General Electric Company under which it is licensed to manufacture incandescent lamps under all patents of the latter company. This company finds a large demand for its popular brand of Ring-O-Lite lamps. The company has also installed latest apparatus for photometry life testing of lamps and this service will be available to all purchasers of lamps and to all persons making investigation in the illuminating field.

National Scale Company (Electrical Division), Chicopee Falls, Mass., has published a booklet describing the National calling system which it manufactures. The system is primarily an operating instrument which is connected by wiring to a line of signals consisting of either bells, horns, buzzers, lights, or whatever other electrical devices it is desired to use. These signals are distributed throughout the establishment in such a manner that every foot of floor space is within the sound radius of at least one signal. The system is usually located, for convenience, near the telephone central within easy reach of the operator's hand. It operates on a voltage of either 110 or 220 alternating or direct current. The signals are controlled by levers on the instrument which set the mechanism for the required code number of the party to be called. This signal is then transmitted to the proper station and the call given. The system is particularly adapted to hotels, schools, offices, public buildings, factories and commercial establishments.

New "Delco" Distributing Point in West.—At a recent convention of dealers and salesmen, held at the Spokane (Wash.) office of the Domestic Engineering Company, it was decided to make Spokane a new distributing point for "Delco" lighting products.

Habirshaw Electric Cable Company and **The Electric Cable Company,** 10 East Forty-third Street, New York City, in its January issue of *The Wire Message*, states that in the insulated wire and cable industry evidence is found of sound prosperity. Reasonable profits have made possible increased and higher efficiency. Most factories are working overtime and orders are booked that cannot be delivered until well into 1917. Reports from all sections of the country indicates no curtailment of demand in the near future. Some decrease in purchasing activity that would bring demand near to maximum production, should be welcomed rather than feared. The industry as a whole has never faced a new year with brighter prospects.

Arc Lamps and Lighting Systems.—Under this title the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued a catalog that should interest all connected in any way with the lighting industry. All apparatus necessary for the operation of the various street-lighting systems in use are listed, including constant-current regulators and controlling panels, and fixtures for Mazda C lamps, in addition to the regular line of flame carbon and metallic flame arc lamps. Among the new apparatus described is a line of reactance-coil regulators for use on circuits remote from stations where apparatus can be used. They are especially designed for service where pole mounting and operation with a time switch is desirable, thus simplifying the circuit construction and reducing the expense of serving outlying towns which may have constant-potential feeder service for residence lighting, but for street lighting have nothing available except multiple lamps or long special series circuits from larger existing installations. They are used with the inexpensive and well-known film cut-out street hoods, no change being required in these devices. The adjuster-socket system is also described, this consisting of a simple series of lamps connected across constant-potential alternating-current mains or across the secondary terminals of a constant-potential transformer. A reactance coil is connected in shunt across the terminals of each lamp and operates to maintain the continuity and normal voltage of the circuit in case of burn-outs or lamp removals. Another new device listed in the catalog is a current transformer with two windings, called the external Luxsolite transformer, for use with Mazda C lamps so as to obtain the greatest safety of a low-tension circuit at the lamp. By its use the advantages of the series system of distribution with the safety of the multiple circuit is combined. The primary winding of the transformer is continuously in the series circuit so that lamp outages do not affect the main circuit. At the same time it enables low-tension wiring to be used in the poles or on the lamp loops, thus producing a much safer installation at little expense. Diagrams are also included of the various types of street-lighting systems, which should be of great use to prospective purchasers. A complete comparison of the different systems, pointing out their particular value in the various places in which they are used, is given. Luxsolite fixtures with Holophane refractors are listed, together with a complete line of outdoor fixtures, ornamental poles, and pole accessories.

LATEST APPROVED FITTINGS

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, after examination and tests conducted under standard of the National Electric Code as recommended by the National Fire Protection Association

ATTACHMENT PLUGS, Fuseless.—The Trumbull Electric Manufacturing Company, Plainville, Conn.

Separable attachment plugs, having porcelain or composition bases or caps. "Trumbull," 660 watts, 250 volts, catalog Nos. 790-1.

Listed December 4, 1916.

BLUE-PRINTING MACHINES AND DRYERS.—Williams, Brown & Earle, 916 Chestnut Street, Philadelphia, Pa.

Automatic motor-driven blue-printing machines and dryers for making blue prints by a continuous process using light of arc lamps, and for drying washed paper with electrically-heated wire coils. "New Express" printers, each lamp requiring 6 to 10 amperes, alternating and direct current, 110-125 volts and 220-250 volts, catalog Nos. 100-03, 105-08; "Franklin" dryers, requiring 40 to 80 amperes, alternating and direct current, 110-125 volts and 220-250 volts.

Listed November 28, 1916.

CABINETS AND CONDUIT BOXES, Sheet Metal.—Starrett Manufacturing Company, Chicago, Ill.

Listed January 6, 1917.

CABINETS AND CUTOUT BOXES, Sheet-Metal Type.—C. Koch, 255 Lake Street, Milwaukee, Wis.

Listed December 22, 1916.

CABLE, Armored. — Triangle Conduit Company, Brooklyn, N. Y.

Marking: Jute cord parallel to conductors between conductors and armor.

Listed December 29, 1916.

COLLECTOR SHOE.—Pawling & Harnischfeger Company, Milwaukee, Wis.

50 horsepower, 110-550 volts.

Listed November 27, 1916.

CONDUIT BUSHINGS. — Detroit Closed Bushing Company, Detroit, Mich.

Sherardized, machined-steel conduit bushings having readily removable metal closures to prevent entry of foreign material into conduit prior to installation of wires. Marking: Knurled edge and stamped trade mark. One-half and three-quarter-inch sizes.

Listed December 18, 1916.

FIXTURES.—Cen-Ke Manufacturing Company, Clinton, N. Y.

Adjustable fixture, consisting of standard socket secured to hinged nipple and mounting clamp, and provided with reinforced cord and standard attachment plug; designed for mounting on sewing machines.

Listed November 17, 1916.

FIXTURES, For Use with Gas-Filled Lamps.—The Horn & Brannen Manufacturing Company, 427 Broad Street, Philadelphia, Pa.

Listed December 13, 1916.

MISCELLANEOUS. — Holcomb & Hoke Manufacturing Company, Indianapolis, Ind.

Automatic corn-popping and peanut machine. This motor-driven machine is electrically illuminated, and is provided with electrical popping and warming units. A peanut attachment, furnished when desired, is also provided with electrical roasting and warming units. Provision is made for grounding metal framework of device. "H. & H." 110 volts, alternating or direct current, 2,900 watts, catalog No. 3E.

Listed November 28, 1916.

RECEPTACLES, Candelabra and Miniature.—General Electric Company, Schenectady, N. Y.

"G. E." porcelain shell.

Miniature, for decorative lighting systems, Christmas-tree lighting outfits and similar purposes. For indoor use only. Catalog No. GE676.

Listed December 1, 1916.

RECEPTACLES, Medium Base.—Bryant Electric Company, Bridgeport, Conn.

Porcelain shell. Keyless, catalog No. 4063-Special.

Listed November 21, 1916.

RECEPTACLES. (For Attachment Plugs) AND PLUGS.—Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins" Spartan. 10 amperes, 250 volts, catalog No. 122.

Listed November 21, 1916.

RECEPTACLES (For Attachment Plugs) AND PLUGS.—Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins" adapters: 20 amperes, 250 volts, catalog Nos. base 2520, receptacle 2528, plug 2567.

Listed December 1, 1916.

RECEPTACLES. (For Attachment Plugs) AND PLUGS.—Trenton Electric & Conduit Company, Inc., Trenton, N. J.

"T. E. & C. Co." 660 watts, 250 volts, catalog No. 180.

Listed November 21, 1916.

RECEPTACLES. (For Attachment Plug) AND PLUGS.—General Electric Company, Schenectady, N. Y.

"G. E." 660 watts, 250 volts, catalog Nos. GE543-47, GE658, GE665, GE682, GE694.

Listed November 21, 1916.

RESISTANCE APPLIANCES. — General Electric Company, Schenectady, N. Y.

"G. E." motor-starting rheostat, type CR-1020.

Speed controllers, types CR-1260-61.

Listed December 26, 1916.

RESISTANCE APPLIANCES.—Rudolph Brothers Company, 553 West Thirty-third Street, New York, N. Y.

Motion-picture rheostats, 25-50 amperes, 110 volts, type A-1.

The general design and construction of this rheostat is acceptable under present standards. It should, nevertheless, be noted that any device of this character will, even under normal current, reach temperatures making it necessary to take special care to avoid installation near combustible material or in a manner which will not afford entire protection against ignition of motion-picture films which may come in contact with rheostats under conditions liable to obtain in practice. It is recommended that for the safety of persons the exposed non-current carrying metal case of these appliances be permanently and effectively grounded.

Listed December 20, 1916.

SIGNS.—The Manheimer Company, 447 West Twenty-eighth Street, New York, N. Y.

Electrically illuminated display signs for general use.

Listed December 12, 1916.

SIGNS.—Novelty Electric Sign Company, 165 Eddy Street, San Francisco, Cal.

Electrically illuminated display signs for general use.

Listed December 21, 1916.

SWITCHES, Automatic.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Float switches, Bulletin No. 10031.

Listed November 28, 1916.

SWITCHES, Fixture.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

"C-H" single-pole. "Brascolite No. 76."

Listed December 26, 1916.

SWITCHES, Fixture.—Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins" single-pole canopy, 0.5 ampere, 125 volts, catalog Nos. 541, 542.

Listed December 5, 1916.

SWITCHES, Inclosed.—Detroit Fuse & Manufacturing Company, 1400 Rivard Street, Detroit, Mich.

Compensator type, 0-200 amperes, 0-600 volts, catalog Nos. 58341-43, 58351-54, 58364.

Listed November 14, 1916.

SWITCHES, Push and Rotary Flush.—Hart & Hegeman Manufacturing Company, Hartford, Conn.

"H. & H." remote control, 6 amperes, 250 volts, catalog No. 2179.

Listed December 19, 1916.

WIRE, Rubber-Covered Fixture.—Eugene F. Phillips Electric Works, Montreal, P. Q.

Marking: Two white threads parallel with conductor, between rubber insulation and braid.

Listed December 27, 1916.

PERSONAL AND BIOGRAPHICAL

MR. J. M. STOVER, of Key West, Fla., has been appointed manager of the Baton Rouge (La.) Electric Company.

MR. W. E. BLACKWELL has resigned as superintendent of the municipal electric-light and waterworks plant at Afton, Okla.

MR. H. R. FEHR, of Allentown, Pa., was re-elected president of the Lehigh Valley Transit Company at the annual meeting of stockholders.

MR. C. E. FAHRNEY, manager of the Ottumwa (Iowa) Railway & Light Company, has been elected director of the Ottumwa Commercial Club for 1917.

MR. R. U. STEELQUIST, local manager of the Oregon Power Company at Dallas, Ore., has been elected a member of the board of directors of the Dallas Commercial Club for 1917.

MR. HARRY ROBINSON, superintendent of the electric department at the plant of the Midvale Steel & Ordnance Company, Coatesville, Pa., has resigned to accept a similar position at the new steel plant of Worth Brothers, Claymont, Del.

MR. P. A. STAPLES, vice-president and general manager of the Binghamton (N. Y.) Light, Heat & Power Company, has been appointed general manager of the Sayre (Pa.) Electric Company, which position he will fill in connection with his duties at Binghamton.

MR. HENRY L. RICE has been elected assistant secretary and treasurer of the Wisconsin Securities Company, of Milwaukee, succeeding MR. GEORGE ALLISON, who has become treasurer of the Baltimore Dry Docks & Shipbuilding Company, one of the interests of the Wisconsin company.

MR. S. F. BOND, who has been connected with the engineering department of W. S. Barstow & Company, of New York City, for several years past, and who has been working on various properties for the company, is now located at Binghamton, N. Y. He is working on the electrical installation of the new plant of the Binghamton Light, Heat & Power Company and later will redesign the distribution system to meet the new conditions.

MR. H. E. FREEMAN, formerly vice-president of the American Trust & Savings Bank, Springfield, O., has been appointed treasurer of the Robbins & Myers Company, of that city. Mr. Freeman was also vice-president and treasurer of the Indianapolis Frog & Switch Company and treasurer of the Fairbanks Building Company and the Fairbanks Company, all of Springfield, and he goes to the Robbins & Myers Company with a broad experience in the line of work in which he will be engaged. MR. W. J. MYERS, who in addition to his duties as vice-president of the Robbins & Myers Company, has previously acted at treasurer, will now be relieved of the duties in connection with the latter position so he can give his entire time to his duties as vice-president.

MR. D. P. TIERNEY has been appointed superintendent of the Sayre (Pa.) Electric Company, with which he has been connected for the past eight years.

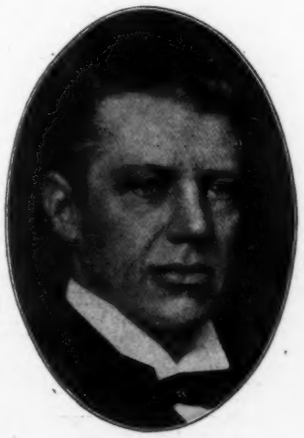
MR. H. L. HANSEN has been appointed assistant treasurer of the Rutland (Vt.) Railway, Light & Power Company, with headquarters in Rutland, Vt. Mr. Hansen until recently was auditor of the Carolina Power & Light Company, Raleigh, N. C.

MR. WILLIAM BELL, superintendent of the Millbury branch of the New England Power Company, has been transferred to the engineering department of the company, at its Worcester office. MR. EVERETT COLLINS, of Brockton, Mass., will succeed Mr. Bell. Both Mr. Collins and Mr. Bell are graduates of the Worcester Polytechnic Institute, class of 1910.

MR. C. NESBITT DUFFY, formerly vice-president and comptroller of the Milwaukee Electric Railway & Light Company, and now manager of the Manila (Philippine Islands) properties of J. G. White & Company, was the guest of honor at a special luncheon tendered him by the Milwaukee Electrical League on January 20. Mr. Duffy has been on a visit to this country for nearly a month, a considerable part of this time being spent at the headquarters of the White organization. On his way back to the Philippines he made a short stop at his former home in Milwaukee, his many old friends taking advantage of this opportunity to again greet him at the luncheon referred to.

OBITUARY.

MR. HENRY GORDON STOTT, superintendent of motive power, Interborough Rapid Transit Company, New York, and former president of the American Institute of Electrical Engineers, died January 15, at his home in New Rochelle, N. Y., in his fifty-second year. Mr. Stott was born in the Orkney Islands, Scotland, and was educated at the College of Science and Arts, Glasgow—now a part of the Glasgow and West of Scotland Technical College. In 1884 he became associated with an electric-lighting company in Glasgow, resigning in 1885 to accept a position with the Anglo-American Telegraph & Cable Company, with which he was connected until 1889, assisting in over 70 cable repair expeditions. Much of his time was taken up in experimental work on the self-inductance of iron-armored submarine cables and developing new methods for locating faults. In 1889 Mr. Stott accepted a position with the Brush Electrical Engineering Company, Bournemouth, England, as assistant engineer in its lighting plant. After a year there he went to Madrid, Spain, and was engaged in the erection of engines, generators, underground systems, etc. From Madrid he returned to the Brush company in London, and was engaged in general engineering work on the chief engineer's staff. In 1891 he left for America and was engaged to install the first underground cables used in Buffalo, N. Y., for lighting and power purposes. During the ensuing years he was engaged in the various kinds of installation work connected with the replacement of small generators with large, laying underground cables, installing new switchboards, in lamp and meter work, etc. In 1897 the company closed a contract with the Niagara Falls Power Company to supply it with electric power and to consolidate the two plants into a new one. The design of this entire plant, together with the storage battery auxiliary, was entrusted to Mr. Stott, in addition to his other duties. In 1901 he accepted the position of superintendent of motive power of the Manhattan Railway Company, New York, to take charge of its new generating plant and substations, as well as of the entire distributing system. When the Manhattan company was merged with the Interborough Rapid Transit Company in 1904, he retained his office and constructed the Fifty-ninth Street power plant, since then managing the entire system, one of the greatest of its kind in the world. Mr. Stott was president of the American Institute of Electrical Engineers during 1907-1908, vice-president of the American Society of Mechanical Engineers during 1912-1914, director of the American Society of Civil Engineers in 1911 and vice-president of the United Engineering Society at the time of his death. He was very active in the A. I. E. E. and was a member of numerous committees in that organization. During his brilliant career Mr. Stott made many valuable contributions to engineering literature, particularly in regard to effecting economies in power-plant operation. He is survived by his widow, a son and a daughter.



H. G. Stott.

MR. JOHN B. SULLIVAN, president of the Ashland (N. H.) Electric Light Company, and a prominent business man of that town, died January 12, aged 58 years. He was a native of the place and was a trustee of the Ashland Savings Bank.

CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

BOOTHBAY, ME. — Customers of the Boothbay Harbor Electric Light & Power Company have filed a petition with the Public Utilities Commission alleging inadequate and insufficient service, and seeking an order requiring relief.

OXFORD, ME.—Complaint has been made to the Maine Public Utilities Commission by customers of the Oxford Electric Company, alleging excessive rates and inadequate service.

PORTLAND, ME.—The Chamber of Commerce is considering the question of the organization of an industrial development association to acquire ownership of a suitable tract of land and to erect a power building thereon in which space will be leased to manufacturers.

SOUTH PORTLAND, ME.—The Cumberland County Light & Power Company is making a number of improvements to its system here which will afford better service.

LOWELL, VT. — The Chrysolite Company's asbestos plant here will be supplied with electric power by the Vermont & Quebec Power Company. Power will be delivered beginning May 1, when the new plant will be completed.

VERNON, VT.—The 20,000-horsepower station of the Connecticut River Power Company is being worked to capacity. An eight-hour day, three shifts, has been adopted.

BOSTON, MASS.—A hearing has been held at the State House on a petition of the Fall River Electric Light Company for authority to erect a transmission line across Taunton River between Fall River and South Somerset. The object of the line is to connect with the system of the New England Power Company, which furnishes hydroelectric energy from its plants on the Deerfield and Connecticut rivers. The line would also enable the Fall River Company to serve a number of manufacturing plants. Proposed towers are of steel, 240 feet high, with a span of 1,800 feet. The line would be built for 66,000 volts. To the proposal of Chairman Cole, of the Waterways Commission, that the wires be put under the river, the company's representative said that the risk of leakage and short circuits would be too great.

GREENFIELD, MASS.—All local manufacturing enterprises except two small plants are supplied with electric power by the Greenfield Electric Light & Power Company. The rates are remarkably low. Energy is obtained from hydroelectric plants on the Deerfield river.

LAWRENCE, MASS.—The Lawrence Gas Company has been given permission to extend its lines in Methuen.

OAK BLUFFS, MASS.—The Vineyard Lighting Company is building an addition to its power station on Beach Road.

BRIDGEPORT, CONN.—The Council is considering an extension of the whiteway system on State Street, from the city hall to Courtland Street, necessitating the installation of 24 lighting units.

DANBURY, CONN.—A plan is under consideration for a dam across the Housatonic River in Brookfield, Conn., 980 feet long, 45 feet high and 48 feet thick at the base, to provide electric generation. New York capitalists are said to be behind the project, which would involve the expenditure of several hundred thousand dollars.

HARTFORD, CONN.—A bill has been introduced in the General Assembly of Connecticut to amend the charter of the Hartford Electric Light Company, authorizing an increase in the amount of capital stock to not over $10,000,000.

HANOVER, N. Y. — The Public Service Commission has authorized the exercise of franchises by the Niagara & Erie Power Company, for an electric plant and distribution lines in Hanover and also the town of Stockholm.

MEDINA, N. Y.—A petition asking for the installation of a municipal plant for street-lighting purposes is being considered by the local Board of Trustees.

MELROSE, N. Y.—The Troy (N. Y.) Gas Company contemplates furnishing electric service here.

NEW YORK, N. Y.—Plans are being prepared for a one-story power house estimated to cost $40,000, for M. Weinstein, at 150 West Sixteenth Street by G. Pegram, architect.

TOTTENVILLE, STATEN ISLAND, N. Y.—The Richmond Light & Railway Company is reported to be planning for the construction of a new 6,000-volt transmission circuit on both sides of Staten Island to afford improved lighting service to the different municipalities.

WATERTOWN, N. Y.—The Public Service Commission has approved franchises of the Northern New York Utilities, Incorporated, of this city, for electric plants and distribution lines in the towns of Orleans, Alexandria and the village of Alexandria Bay. The company has been doing business in the town of Alexandria and the village of Alexandria Bay since its acquisition of the Watertown Light & Power Company's property and the system formerly owned by the St. Lawerence International Railroad & Land Company. The franchise and the order of the commission provide that these lines now authorized may not interfere with the electric business already established by Holmes Brothers in Redwood.

BAYONNE, N. J.—The Downtown Business Men's Association has appointed a committee to assume active charge of plans to install a street-lighting system along the lower section of Broadway. Thomas M. O'Brien is chairman.

FLORENCE, N. J.—Citizens are circulating a petition to present to the Public Service Electric Company for the installation of an electric system for street lights and house service. The petition will guarantee the company a sufficient number of consumers to warrant the installation.

HOBOKEN, N. J.—The North Bergen Township Committee has granted the New York Telephone Company permission to install overhead and underground lines in 20 streets of the township.

JAMESBURG, N. J.—Louis H. Saab has made application to the Borough Council for a franchise for the installation of an electric-light and power system to serve all sections of the borough. It is planned to organize a company to be known as the Louis H. Saab Engineering Company and install an electric plant for local service.

MORRISTOWN, N. J.—The Morris County Traction Company has decided to purchase electric power from central stations and is dismantling its former plants at Dover and Chatham. The Dover plant has not been operated for over a year. Power for the southern section of the company's system is furnished by the Millburn Electric Company, for the central division by the Morris & Somerset Electric Company, and for the northern division by the North Jersey Power Company, Dover.

NEWARK, N. J.—The Board of Freeholders is planning for an addition to the boiler plant at Overbrook Hospital.

PERTH AMBOY, N. J.—Property owners on Smith Street, between High and State Streets, are planning for the installation of a new street-lighting system. The Public Service Electric Company is negotiating to make the improvement.

WASHINGTON, N. J. — The Borough Council will receive bids up to February 19 for lighting the streets and public buildings of the borough. Jacob H. Hahn is Borough Clerk.

WOODBURY, N. J.—The City Council is arranging an appropriation of $7,500 for street lights in its 1917 budget.

ERIE, PA.—City Electrician William Crane has submitted a report to the City Council on plans and costs for the reconstruction of the State Street conduit system, extending it into West Eleventh and East Twelfth Streets and placing an ornamental lighting system along the city's main thoroughfare from Second to Fourteenth Streets. Plans are also being prepared for construction of a conduit in Parade Street from Fourteenth to Sixteenth Streets under the Parade Street subway. The cost which includes an ornamental lighting system under the subway is estimated at $1,300.

PHILADELPHIA, PA.—The Public Service Commission of Pennsylvania has approved the application of the Pennsylvania Heat, Light & Power Company and thirteen other companies to transfer their property and franchises to the Philadelphia Electric Company. All the companies are in Philadelphia, and it was desired to bring them under one management.

PITTSTON, PA.—Tentative plans have been prepared for the installation of a large power plant here, according to a statement by D. T. Campbell, general manager of the Scranton Electric Company which purchased the local plant of the Citizens Electric Illuminating Company last spring.

READING, PA.—The Reading Transit & Light Company, which controls the Metropolitan Electric Company, operating here, has placed in service a 12,500-kilowatt turbogenerator. Power business already contracted for will absorb this capacity and an additional generator of 25,000 kilowatts capacity has been ordered for delivery in 1918 to take care of future business.

GRANTSVILLE, MD.—An electric lighting plant is being installed in this city.

BALTIMORE, MD.—The Pennsylvania Railway Company will expend $10,000,000 for enlarging its Calvert Street terminals and other local improvements. Electricity will be substituted for steam as a motive power for hauling trains through the tunnels through the open space between Greenmount Avenue and the northern part of the city and elsewhere in the city limits.

WILLIAMSBURG, VA.—E. H. Clowes, of Richmond, will build an electric-lighting plant here.

HARTLAND, W. VA.—W. S. Barstow & Company, 50 Pine Street, New York City will have charge of the construction of a power plant for the Hartland Power Company, incorporated recently with a capital of $700,000, which will furnish electrical energy for the operation of coal mines of the Hartland Colliery Company.

TENNILLE, GA.—City officials have completed plans for the installation of a new electric-lighting plant here.

NORTH CENTRAL STATES.

CHADRON, O.—The Ohio Gas & Electric Company has accepted a franchise granted the company by the County Commissioners several weeks ago, giving it permission to string a feed wire on the county roads to supply several manufacturing plants with electricity.

CINCINNATI, O.—W. G. Burrell, an attorney, has filed a number of suits in Athens, O., for the condemnation of property which will be required by the Buckeye Hydroelectric Company in its plans for the construction of hydroelectric power plants.

CLEVELAND, O.—The Cleveland Electric Illuminating Company has filed application with the State Public Utilities Commission for authority to issue $2,000,000 worth of bonds for improvements, extensions and betterments of its property.

HOLGATE, O.—The city has granted a franchise and entered into contract with the Northwestern Ohio Light Company for electric service. A transmission line will be constructed from the company's Leipsic plant and the Holgate waterworks operated by electrically driven pumps.

MIDDLETOWN, O.—The American Rolling Mill Company plans to erect a 22,000-volt

transmission line from its Central Works to its East Side Works.

PIQUA, O.—The Dayton Power & Light company will expend $25,000 to install the proposed boulevard lighting system.

PIQUA, O.—The Bell Telephone Company will erect a $38,000 building and place the wires underground in the business district at an estimated cost of $135,000.

SPRINGFIELD, O.—The City Commission will advertise for bids for installing a $7,000 police-signal system. C. E. Ashburner is City Manager.

TOLEDO, O.—Plans are being prepared by the Toledo Railways & Light Company for a system whereby Toledo will be circled by high-tension lines solely for the supply of power to the local industries. Milan R. Bump, chief engineer of Henry L. Doherty & Company, says this will involve an expenditure which cannot even be estimated at the present time, but the industrial possibilities of Toledo are so great that the expenditure will be amply justified. Wires for the new high-tension belt will be strung as soon as the new power house is completed.

VAN WERT, O.—The City Council will install a modern ornamental street-lighting system in the business district. The Northwestern Ohio Light & Power Company has agreed to install standards of a design selected by the city.

HOBART, IND.—The Public Service Commission has granted the town authority to issue $15,000 in bonds to pay for improvements to the electric-lighting plant.

EAST ST. LOUIS, ILL.—The Rapid Transit Company of Illinois will build an interurban road in Southern Illinois. The initial plans are to build a system that will connect Southern Illinois towns with East St. Louis. The company's office is in the Cosmopolitan Building, East St. Louis. William Martin is president and W. C. Beare is secretary-treasurer.

CARROLLTON, ILL.—The question of issuing $25,000 in bonds for the construction of a municipal electric-lighting plant is being considered here.

GALESBURG, ILL.—The City Council is considering plans for an ornamental lighting system in North Broad Street, the Public Square and South Broad Street.

OTTAWA, ILL.—It was decided at a special election to extend the underground conduit system to the Illinois-Michigan Canal instead of only in the "loop" district as originally planned.

SPRINGFIELD, ILL.—The Springfield & Carbondale Railway Company has been incorporated with a capital of $100,000 to build an electric-railway line from Springfield to Carbondale via Hillsboro, Greenville, Carlyle, Nashville and Pinckneyville. The incorporators are Howard White, William R. Edison, Daniel P. Roberts and William C. Schaeffer, all of Chicago.

SPRINGFIELD, ILL.—A new ornamental lighting system is to be installed in Springfield as soon as the City Commissioners decide on what style of lamp posts to install. The latest plan submitted to the commissioners is modelled after the "Path of Gold" on Market Street in San Francisco. Commissioner Spaulding is now on a trip to the cities which recently have installed ornamental systems.

BATTLE CREEK, MICH.—That the proposed electric line between Owosso and Flint, Mich., will be built this year is the assurance given out by the Michigan Railway Company. The line will be completed by October 1 and will be a direct connection with Kalamazoo, Battle Creek, Lansing, Jackson and other cities in the Michigan Railway system. The third-rail system will be used. J. F. Collins is general manager of the company.

MILWAUKEE, WIS.—At the annual meeting of the Wisconsin Securities Company plans were made for extensive improvements to its properties during the year. A new transmission line between Green Bay, Two Rivers and Manitowoc, taking in the towns of Denmark, Chilton and Brillion, is to be finished as well as a 7,000-horsepower steam reserve station in Green Bay. Other improvements will be or have been made at the plants of the Sheboygan Gas Company and the Manitowoc Power Company. Extensions to the company's holdings in Baltimore, Md., are also planned.

WATERFORD, WIS.—A franchise has been granted to the Milwaukee Electric Railway & Light Company to furnish electric service here.

CHISHOLM, MINN.—The Minnesota Utilities Company, recently incorporated with a capital of $1,000,000, has effected a merger of the Chisholm Electric Company of this city; the Home Electric & Heating Company of Eveleth, and the Western Mesaba Electric Company of Coleraine. The new concern will serve the Eveleth district through the plant of the former Home Electric & Heating Company; Chisholm, Spina, Kinney and Lucknow through the Chisholm plant, and Coleraine, Bovey, Taconite, Marble and Calumet through the facilities formerly controlled by the Western Mesaba Power Company. It also owns the transmission lines connecting the towns on the western end of the Mesaba Range with Nashwauk. Extensive improvements will be undertaken at Eveleth, Chisholm and points in the Western district. R. M. Haskett, of this city, is secretary-treasurer.

CEDAR RAPIDS, IOWA.—The Iowa Railway & Light Company is preparing plans for a power house in North Sixth Street to cost $20,000.

NEW CAMBRIA, MO. — Electric service for this town probably will be secured from the municipal plant at Macon, necessitating the erection of a transmission line from Callao to New Cambria, about eight miles.

WEBB CITY, MO. — The Commercial Club has endorsed a movement started by the lighting committee of the Council to build a municipal light and ice plant.

GREAT BEND, KANS.—A petition signed by nearly every business man in Great Bend has been presented to Mayor Dawson asking for the installation of a white-way system in the business district.

WICHITA, KANS.—Eastern capitalists have become interested in the possibilities of an electric line connecting Wichita with the oil fields of Augusta and Eldorado. William R. Burr, of Washington, D. C., and his associates have written to Gregory Thompson, of Wichita, regarding traffic conditions between Wichita and Eldorado and Wichita and other towns in the oil district.

DODGE, N. D.—The Golden West Telephone Company has been incorporated with a capital of $5,000. It proposes to construct 50 miles of line in Dunn County, radiating out of Dodge. Otto Baumen, of Defiance, is manager of the company.

SOUTH CENTRAL STATES.

BOONESVILLE, KY.—The city has voted a bond issue of $10,000 to provide for the installation of an electric-lighting plant.

CLAY, KY.—Mitchell & Dunnigan, owners of the local electric-light plant will build a transmission line to Dixon, Ky., and furnish the community with electricity.

LA CENTER, KY.—The LaCenter Light & Power Company has been organized by owners of the local lighting plant, which will be enlarged and improved. S. T. Payne is president of the company.

LOUISVILLE, KY.—It is currently reported in Louisville that the Interstate Public Service Company, operating the utilities of Jeffersonville and New Albany, Ind., and other properties in Indiana, is contemplating construction of a hydro-electric power plant on the Blue River at White Cloud, in Harrison County, west of Louisville. Surveys and data indicate, it is said, that a dam 100 feet high would confine the water in the low lands for a distance of nine miles upstream and that the reservoir would suffice for the dry seasons. Power sufficient to provide the needs of Jeffersonville, New Albany and a town the size of Louisville would be developed, according to reports.

MANCHESTER, KY.—An electric-lighting plant, estimated to cost $25,000, is proposed by the Mayor and citizens. A bond issue is contemplated or subscriptions to stock taken.

MIDDLEBORO, KY.—The Kentucky Aramature and Motor Works Company has been organized here by J. W. Wilson and H. A. Johnson.

CANEY FALLS, TENN.—The first unit of the Great Falls power plant of the Tennessee Power Company, at Caney Falls, has been completed and is now in operation. Construction of the plant involved an outlay of nearly a million dollars. A dam confines the water of the two rivers and a tunnel through a mountain directs the stream into the turbines.

CUMBERLAND SPRINGS, TENN.—The Cumberland Springs hotel has been purchased by Lem Motlon, who will install an electric-lighting plant.

CLARKSDALE, MISS.—The City Commissioners will open bids for furnishing transformers, meters, lamps and other electrical supplies for the water and light department for 1917. R. E. Stratton, Jr., is City Clerk.

YAZOO CITY, MISS.—The Public Service Commission has authorized the city to install a new municipal electric lighting plant which is estimated to cost $20,000.

ADA, OKLA.—It is reported that the Oklahoma Light & Power Company has plans perfected for the erection of a $3,000,000 power plant four miles north of Ada, on the Canadian River. The plant will be controlled by Mainland Brothers, of Chicago, and will furnish electricity to Shawnee, Oklahoma City, Guthrie, Ada, El Reno, Pauls Valley, Madill, Coalgate, McAlester and other cities. Work will be commenced February 1.

OKLAHOMA CITY, OKLA.—It will cost $187,000 to build a power plant for the state capitol, according to an estimate prepared by Max L. Cunningham, state highway engineer. The plans provide for the installation of five 250-horsepower boilers.

WESTERN STATES.

THOMPSON FALLS, MONT.—Work of installing a wireless telegraphy station at the plant of the Thompson Falls Power Company has been started and eventually a station will be installed at every plant in the system of the Montana Power Company, so that no matter what happens to the wires communication between the plants can be maintained. Similar plants have already been built at Lewistown and Great Falls.

CASA GRANDE, ARIZ.—The Mountain States Telephone Company has begun work on the telephone system to be installed here. As soon as bids are received, and contracts let, work will begin on the new municipal electric-lighting plant.

GLENDALE, ARIZ.—The Mountain States Telephone & Telegraph Company is constructing new toll lines from this city to points in the northern part of the state.

MESA, ARIZ.—This city has made a formal offer of $113,000 for the property of the South Side Gas & Electric Company. It is understood that the offer will be accepted.

PRESCOTT, ARIZ.—Work has been started on the $1,000,000 auxiliary electrical plant of the Arizona Power Company. The new plant will have a capacity of 10,000 horsepower, and will be connected with radiating lines from the company's Fossil Creek plant.

KENDRICK, IDAHO. — Work has been started by the local power company on the construction of a high-tension transmission line to Moscow.

INDEX, WASH.—The City Council has authorized the holding of a special election to vote on the construction of the proposed $20,000 municipal lighting plant.

OLYMPIA, WASH.—Articles of incorporation have been filed for the Intermountain Power Company by L. O. Evans, C. F Kelly and others of Butte, Mont. It is reported that the object of the company

DATES AHEAD.

Electrical Contractors' Association of Iowa. Semi-annual meeting, Cedar Rapids, Iowa, January 30-31. Secretary-treasurer, M. T. Humphrey, Waterloo, Iowa.

American Institute of Electrical Engineers. Mid-winter convention, New York City, February 7-9. Secretary F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

New Mexico Electrical Association. Annual convention, Albuquerque, N. M., February 12-14. Secretary pro tem., E. A. Thiele, Roswell, N. M.

Southeastern Electrical and Gas Association. Annual convention, Dallas, Tex., April 26-28. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

Wisconsin Electrical Association. Annual meeting, Hotel Pfister, Milwaukee, Wis., March 15-16. President, W. E. Haseltine, Ripon, Wis.

Arkansas Association of Public Utility Operators. Annual convention, Pine Bluff, May 16-18. Secretary-treasurer, R. B. Fowles, Pine Bluff Company, Pine Bluff, Ark.

Electric Supply Jobbers' Association. Semi-annual meeting, Homestead Hotel, Hot Springs, Va., May 22-24. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

is the electrification of the Milwaukee lines in Washington.

SALEM, ORE.—At a meeting of the State Board of Control the advisability of acquiring a power site on North Mill Creek to generate and furnish power for the state institution and the capitol was discussed.

STAYTON, ORE.—The Stayton Electric Company is planning improvements to its plant which will enable it to furnish additional service in this vicinity. The company will start a campaign on the installation of rural service. C. E. Taylor is manager of the plant.

FRESNO, CAL.—A new electrolier lighting system will be installed on J street from Inyo Street to Los Angeles Street.

LOS ANGELES, CAL.—Bids for lighting the city streets with arc lamps are being received by the Board of Public Works.

LOS ANGELES, CAL.—Bids have been called for furnishing 33,000-volt insulators and hardware for the use of the Public Service Department.

LOS ANGELES, CAL.—The Board of Supervisors has called for bids for installing an additional street-lighting system in the Verdugo lighting district and in the Lawndale lighting district.

LOS ANGELES, CAL.—The Department of Agriculture, Washington, D. C., has called for bids for furnishing 14 motors, ranging from 2 to 20 horsepower of alternating-current, variable-speed types to be delivered at Summerland, Cal.

MERCED, CAL.—The Railroad Commission has been asked to place a valuation on the electric light and power lines of the San Joaquin Light & Power Company. The city contemplates calling an election to vote bonds to pay for the acquisition of the electric properties of the power company in order to gain control of the distribution of electric power.

OXNARD, CAL.—The Ventura County Power Company has started work on the reconstruction of its transmission line, which will cost $20,000.

RIVERSIDE, CAL.—The Southern Sierras Power Company suffered damage to the extent of $100,000 during the recent storm and is rushing men and material to repair its steel tower line in Inyo County.

SAN FRANCISCO, CAL.—The Eleanor Mining Company has been granted permission to use the water of Jabone Creek, in Tuolumme County, for the generation of electric power to operate the company's mine.

SAN FRANCISCO, CAL.—The complaint of the Plumas Light & Power Company against the Great Western Power Company has been dismissed by the Railroad Commission. The Great Western Power Company is now authorized to build its transmission line from Big Meadows dam to the Engels Copper Company's mine and to the Philadelphia Exploration Company's mine at Crescent Mills, and also a connecting line from Indian Valley to Crescent Mills.

SAN FRANCISCO, CAL. — Application has been made to the Railroad Commission by the Western States Gas & Electric Company for permission to exercise a franchise granted them by the Supervisors of Trinity County. The franchise grants permission to install a transmission system in the western portion of the county. The Northern California Power Company, Consolidated, has a similar franchise granted by the Supervisors for the eastern part of the county. The Northern California Power Company's franchise is being opposed by the California Oregon Power Company, which operates in the eastern portion of the county.

SAN FRANCISCO, CAL. — The Railroad Commission has authorized the Oro Electric Corporation and the Oro Water, Light & Power Company to sell their public utility properties, with certain exceptions, to the Pacific Gas & Electric Company. The latter company has been authorized to issue at not less than 90 per cent of face value its general and refunding bonds to realize the sum of $1,491,151 to reimburse the treasury for money expended in the purchase of the bonds of the Oro Electric Corporation. Extensive improvements will be started at once by the new owner.

SANTA BARBARA, CAL.—Santa Barbara Gas & Electric Company will build an addition to its power station on Quarantina Street. A new generating unit will be installed.

HONULULU, HAWAII.—Plans are being formed by Japanese and Chinese business men of this place to petition the next Legislature to grant them a franchise for the installation of an electric light and power plant. It is the intention to form a corporation.

Financial Notes

The net income of the Tacoma (Wash.) Railway Light & Power Company for 1916 was $179,146, an increase of $49,928 over 1915.

Kellogg Switchboard & Supply Company's gross business is reported to be about $4,000,000 over the previous year, or an increase of 40 per cent.

The Great Northern Power Company has called for payment at 101 and interest February 1 through the Philadelphia Trust Company all its outstanding collateral trust six-per-cent notes due February 1, 1918.

In the year ended December 31, 1916 the Denver Gas & Electric Light Company installed 9,292 gas and electric meters, adding that many consumers to its list. It is estimated by the company that the population of Denver increased 27,000 in 1916.

All of the $4,800,000 Consolidated Gas, Electric Light & Power Company, of Baltimore, general-mortgage 4.5-per-cent gold bonds offered by Brown Brothers & Company, Alexander Brown & Sons, Jackson & Curtis and Lee Higginson & Company have been sold.

Total sales of the Manhattan Electrical Supply Company, Inc., for 1916 were $4,929,853, as compared with $3,755,823 in 1915, an increase of $1,174,029, or about 31 per cent. The preferred stock of this company was recently offered by Chandler & Company, Inc., of New York and a syndicate of eastern and western bankers.

As a completion of the refinancing plan, the United Water, Gas & Electric Company, of Hutchinson, Kan., has sold to Henry L. Doherty & Company and Hornblower & Weeks, New York City, $350,000 six-per-cent preferred stock. Last fall the company sold $991,000 of first and refunding bonds and retired three underlying bond issues.

The Western States Gas & Electric Company has filed application with the California Railroad Commission for authority to create a ten-year, six-per-cent note issue for $5,000,000, to secure the payment of this indebtedness by a trust indenture, and to sell of this issue notes of a par value of $1,564,000 for paying existing indebtedness and to spend $300,000 for construction during 1917.

Pacific Gas & Electric Company has sold to the National City Company and Harris, Forbes & Company, New York City, $3,060,000 general and refunding five-per-cent bonds, which will be offered to yield about 5.45 per cent. Proceeds of the issue go to pay for the Oro Electric Corporation properties, for funds advanced to pay off underlying bonds and for extensions and improvements. This issue makes $32,988,000 of the general and refunding bonds outstanding.

The New York Upstate Public Service Commission has authorized the issue and sale at not less than 87 of $216,000 of the first-mortgage five-per-cent bonds of the Salmon River Power Company. The bonds are guaranteed principal and interest by the Niagara, Lockport & Ontario Power Company. The proceeds will be held in the treasury of the company, pending an investigation by the commission into their use, which is stated to be the acquisition of the Pulaski Electric Light Company and certain new construction. Because of the favorable bond market the issue of the securities was approved by the commission at this time.

Stockholders of Detroit Edison Company at a meeting February 5 will be asked to approve an increase in the authorized capital stock of the company from $25,000,000 to $35,000,000. There is now outstanding $19,814,200 stock and in addition $2,761,400 of the unissued stock is reserved against convertible debentures, leaving but $2,424,400 capital stock free to be issued out of the present authorized amount. With the approval of the increase in capital stock the directors will offer at once to stockholders a part of the new stock at par in the proportion of 15 per cent of the new stock to their present holdings. The board in a statement to stockholders says that the constantly increasing business requires large capital expenditures each year which must be met partly by the sale of bonds and partly by the issuance and sale of capital stock. In order that the company may have stock on hand for this purpose the board has recommended the increase in the authorized capital stock to $35,000,000 and also that the board be authorized to issue and dispose of this stock from time to time.

Revenues of the public utilities companies in 1916 were heavier than in any

WEEKLY COMPARISON OF CLOSING-BID PRICES OF ELECTRICAL SECURITIES.
Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

	Div. Rate Per Cent	Bid Jan. 15	Bid Jan. 22
Public Utilities—			
Adirondack Electric Power of Glens Falls, common	....	27	26
Adirondack Electric Power of Glens Falls, preferred	6	89	87
American Gas & Electric of New York, common	10+extra	141	140
American Gas & Electric of New York, preferred	6	50½	50½
American Light & Traction of New York, common	....	384	371
American Light & Traction of New York, preferred	6	113	113
American Power & Light of New York, common	4	80	83
American Power & Light of New York, preferred	6	89	92
American Public Utilities of Grand Rapids, common	....	39	38
American Public Utilities of Grand Rapids, preferred	6	71	71
American Telephone & Telegraph of New York	....	123½	123⅝
American Water Works & Elec. of New York, common	....	112	111½
American Water Works & Elec. of New York, particip	7	27	27
American Water Works & Elec. of New York, first preferred	....	72	73
Appalachian Power of Bluefield, common	....	7½	7½
Appalachian Power of Bluefield, preferred	7	41½	38
Cities Service of New York, common	6	309	309
Cities Service of New York, preferred	6	93½	93¾
Commonwealth Edison of Chicago	8	136¾	135½
Comm. Power, Railway & Light of Jackson, common	4	60	*59½
Comm. Power, Railway & Light of Jackson, preferred	6	84	82½
Federal Light & Traction of New York, common	....	14	13
Federal Light & Traction of New York, preferred	....	55	54
Illinois Northern Utilities of Dixon	6	82	84
Middle West Utilities of Chicago, common	....	60½	61
Middle West Utilities of Chicago, preferred	6	80½	80½
Northern States Power of Chicago, common	7	104	105
Northern States Power of Chicago, preferred	7	98½	99
Pacific Gas & Electric of San Francisco, common	5	62¾	64¾
Pacific Gas & Electric of San Francisco, preferred	6	94	94½
Public Service of Northern Illinois, Chicago, common	7	113	111
Public Service of Northern Illinois, Chicago, preferred	6	100	100
Republic Railway & Light of Youngstown, common	4	48	48¾
Republic Railway & Light of Youngstown, preferred	6	74	74
Standard Gas & Electric of Chicago, common	....	14½	14½
Standard Gas & Electric of Chicago, preferred	6	41½	41½
Tennessee Railway, Light & Power of Chattanooga, common	....	9½	9½
Tennessee Railway, Light & Power of Chattanooga, preferred	6	43½	43
United Light & Railways of Grand Rapids, common	4	48½	49
United Light & Railways of Grand Rapids, preferred	6	77½	77
Western Power of San Francisco, common	....	19	18½
Western Power of San Francisco, preferred	6	67	68
Western Union Telegraph of New York	5+extra	95⅞	98¾
Industrials—			
Electric Storage Battery of Philadelphia, common	4	66	66¼
General Electric of Schenectady	8	167½	169½
National Carbon of Cleveland, common	8	329	†300
National Carbon of Cleveland, preferred	7	133	†130½
Westinghouse Electric & Mfg. of Pittsburgh, common	5+extra	53⅜	52½
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	69	70

* Extra Dividend.
† Last Sale.

preceding year, with the greatest earnings by the electric light and power companies, estimated at their stations upward of 25 per cent larger in electrical energy than in the year before. Electric railway companies, though showing a somewhat smaller proportion of gain, nevertheless did well, particularly in the second half of the year. The interests identified with public utilities in this country assert that in the current year even better results will be obtained than in the prosperous 1916 period. As a sign of the times it is interesting to note that Wall Street houses are devoting more attention than ever before to public utilities securities, and that many prominent houses which for years dealt in nothing but government and railroad bonds now include public utilities issues in their offerings.

Dividends.

	Term	Rate	Payable
Bangor Ry. & Elec....	Q	0.5 %	Feb. 1
Brazilian L. St. & Pw.	Q	1 %	Mar. 1
Cities Service	M	0.5 %	Mar. 1
Cities Service.....Stk.		0.5 %	Mar. 1
Com. Pw., Ry. & Lt...	Q	1 %	Feb. 1
Com. Pw., Ry. & Lt...	Q	1.5 %	Feb. 1
Gd. Rapids Ry., pfd...	Q	1.25%	Feb. 1
Illum. & Pw. Sec., pfd.	Q	1.75%	Feb. 15
Kellogg Swbd. & Sup...	Q	2 %	Feb. 4
Kellogg Swbd. & Sup. Stk.		33 1/3 %	Jan. 27
Lehigh Val. Tran., pfd.	Q	1.25%	Feb. 10
Lewiston A. & W., pfd.	Q	1.5 %	Feb. 1
Lowell Elec. Lt.....	Q	2.5 %	Feb. 1
Monon V. Trac.....	Q	1.25%	Feb. 1
Montreal Lt., H. & Pw.	Q	2 %	Feb. 15
No. American.....	Q	1.25%	Apr. 2
Pac. Pw. & Lt., pfd...	Q	1.75%	Feb. 1
Phila. Rapid Transit..	....	$1.25	Jan. 31
Pub. Serv. Inv., pfd...	Q	1.5 %	Feb. 1
Ry. & Lt. Sec.....	....	3 %	Feb. 1
Ry. & Lt. Sec., pfd...	....	3 %	Feb. 1
Sierra Pac. Elec., pfd.	Q	1.5 %	Feb. 1
Texas Pw. & Lt., pfd.	Q	1.75%	Feb. 1

Reports of Earnings.

STANDARD GAS & ELECTRIC.

The Standard Gas & Electric Company net income for the 12 months ended November 13, 1916, increased $538,781, or 82.38 per cent over the figures for the 12 months ended November 30, 1915. Included in the gross income of $1,990,314 was an item of $344,327 representing the profit for the year on sales of securities, and of this amount $311,857 was the profit on the sale of $1,924,500 bonds owned by the company, which were called for redemption. The comparative summary of income for the 12 months' period is as follows:

	1916	1915
Gross earnings.....	$1,679,115	$1,521,505
Net earnings.....	1,623,696	1,479,473
Gross income	1,990,314	1,483,219
Interest charges	797,056	828,742
Net income	1,193,258	654,477

WESTERN UNION.

The Western Union Telegraph Company's report of earnings for the 12 months ended December 31, 1916, compare as follows:

	1916	1915
Total revenue	$63,632,295	$52,475,721
Depreciation, repairs, etc.	8,711,914	8,554,018
*Taxes, etc.	41,071,112	32,418,522
Total expenses	49,783,026	40,972,541
Balance	13,849,269	11,503,180
Bond interest	1,331,850	1,335,588
Surplus	12,517,419	10,167,592

*And sundry operating expenses and rent of leased lines.

CITIES SERVICE.

Cities Service Company closed a record year with a record month, the revenues for December, 1916, being the largest for any one month in the history of the company. For this period gross income was $1,570,819, larger by $1,038,624 than December, 1915, and $242,431 greater than November, 1916, the previous record month. From every viewpoint 1916 was the most successful in the company's history. For the year gross was $10,110,343, an increase of $5,630,543, or over 100 per cent over 1915, with a balance for the common stock, after all expenses, charges and preferred dividends, of $7,202,302, an increase of $4,955,363, or 220 per cent. This balance earned for the junior issue was equivalent to 36.74 per cent, as compared with 15.27 per cent in 1915. The year just closed saw the company further increase its margin of earnings over the preferred dividend requirements, when the dividend on this issue was earned 3.99 times for the 12 months ending December 31, 1916, as compared with 3.77 times for the 12 months ending November 30, 1916, and 2.43 times for the 12 months ending December 31, 1915. The revenues for the company in December were by far the largest in its history. After providing for all expenses, charges and preferred dividends, the surplus for the month was at an annual rate of 68.2 per cent on the common stock, while for the last six months of 1916 the company earned at an annual rate of over 40 per cent on the amount of common stock outstanding at the end of the year. The total surplus and reserve as of December 31, 1916, was $11,401,542. The company closed the year with no floating debt and a large cash balance.

	1916	1915
Gross earnings.....	$10,110,342.90	$4,479,800.44
Expenses	239,389.70	172,856.15
Net earnings.....	9,870,953.20	4,306,944.29
Interest on notes and debentures....	258,960.44	490,000.00
Net to stock.....	9,611,992.76	3,816,944.29
Dividends, preferred stock.....	2,409,690.92	1,570,005.00
Net to common stock	7,202,301.84	2,246,939.29
Dividends, common stock	627,361.72	.....
Net to surplus and reserves	6,574,940.12	2,246,939.29

Proposals

STEEL TOWERS.—Sealed proposals will be received by the Lighthouse Inspector, Philadelphia, Pa., until February 6 for three structural-steel towers for Marcus Hook range front, Chester range front, and Chester range rear light stations, Delaware and Pennsylvania. Further information may be had on application to the above-named officer.

ELECTRIC ELEVATORS.—Sealed proposals will be opened in the Supervising Architect's office, Treasury Department, Washington, D. C., January 31 for the installation complete of three electric elevators in the United States posfoffice at New Haven, Conn., in accordance with the drawings and specification, copies of which may be had at that office in the discretion of the Supervising Architect, James A. Wetmore, Acting Supervising Architect.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 625, Boston, Mass., 540 pounds of copper tubing. Schedule 628, Brooklyn, N. Y., and Mare Island, Cal., miscellaneous interior communication cable, telephone cable, single and twin conductors, and wire for illuminating outfits. Schedule 629, Washington, D. C., 40 sets of semi-circular corrector magnets. Schedule 633, Brooklyn, N. Y., 300 snap switches. Bidders desiring to submit proposals should make application to the Bureau or to the nearest navy yard purchasing office.

Incorporations

ST. CATHERINES, ONT.—Ritter Illuminating & Manufacturing Company. Capital, $75,000. Manufacture electrical appliances, lamps, etc.

BANGOR, ME.—H. L. Wheelden Company. Capital, $10,000. Contracting business. Incorporators: H. L. Wheelden and others.

HASTINGS, MICH.—Michigan Porcelain Insulator Company. Capital, $25,000. Incorporators: E. Tyden, R. B. Messer, W. W. Peck and A. L. Grainger.

BUFFALO, N. Y.—Lovejoy Electric Company. Capital, $15,000. Electrical supplies, etc. Incorporators: Charles J. Peck, Edwin B. Debus and Arthur A. Debus.

BROOKLYN, N. Y.—Charles Moncrieff, Inc. Capital, $1,000. Electrical contractors, etc. Incorporators: Charles Moncrieff and E. M. Moncrieff, 1189 Decatur Street.

DOVER, DEL.—The Electric Contracting Company. Capital, $25,000. To operate as electrical contractors. Incorporators: John W. Moore, John A. Spahn and George G. Stiegler, Wilmington, Del.

WALLINGTON, N. J.—American Jobbers' Supply Company. Capital, $50,000. Electrical and mechanical engineers. Incorporators: W. M. Carpenter, M. L. Joslyn, A. G. Jarmin and E. S. Hough.

UNION HILL, N. J.—Herzog Lamp Company. Capital, $25,000. To manufacture incandescent lamps. Incorporators: Edward J. Simon, 149 Palisade Avenue, Union Hill; John T. Simon and William F. Herzog.

PENN YAN, N. Y.—Short Electrical Manufacturing Corporation. Capital, $40,000. Incorporators: Henry M. Short and Wm. T. Morris, Penn Yan, N. Y., and Ezra O. McDowell, 154 Nassau Street, New York City.

SEATTLE, WASH. — Metropolitan Electric Company. Capital, $20,000. Manufacture switchboards, cabinets and lighting specialties. Incorporators: Charles L. Moses, Clyde Moses and A. M. Asseltine, 524 First Avenue South.

NEW YORK, N. Y.—The Indesco Lighting Fixtures Company. Capital, $5,000. Electric fixtures. Incorporators: A. Frankenberg, 1200 Madison Avenue, and H. E. Reid, 165 Audubon Avenue.

NEW YORK, N. Y.—Multiplex Fuse Corporation. Capital, $10,000. Manufacture electrical appliances, fuses, etc. Incorporators: Richard Ely, Short Hills, N. J.; David Cohen, New York City, and Andrew C. Knoeller, Jersey City, N. J.

NEW YORK, N. Y.—Electric Car & Locomotive Corporation. Capital, $1,000,000. Incorporators: Andrew H. Dirk, Bloomfield, N. J.; Walter V. Wightman, Staten Island, N. Y., and Ralph H. Beach, 2 West Seventy-second Street, New York City.

DOVER, DEL.—The Nicholson Furnace Manufacturing Company. Capital, $200.000. To manufacture motor and steam-driven fans, regulators and smokeless furnaces. Incorporators: George H. Harman, Jesse J. Fry and Louis L. Hopkins, New York City.

ALBANY, N. Y.—The Moody Engineering Company, Inc. Capital, $250,000. To operate as electrical and mechanical engineers. Incorporators: R. H. Jones, F. R. and R. D. Moody, 115 Broadway, New York City.

JERSEY CITY, N. J.—The Frederick D. Shaper Elevator Company. Capital, $75,000. To manufacture elevators. Incorporators: Frederick D. Shaper, 29 Pennington Avenue, Newark, N. J.; Philip Halpin, Kearny, and Adam Steer, 467 West One Hundred and Sixty-sixth Street, New York.

Electrical Patents Issued January 16, 1917

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,212,169. Steering Wheel. C. Bateholts, assignor to Specialty Insulation Mfg. Co., Hoosick Falls, N. Y. Has an insulating covering.

1,212,176. Safety Device for Presses. R. B. Benjamin, assignor to Benjamin Electric Mfg. Co., Chicago, Ill. Electromagnetically tripped clutch of a punch press. Can only be operated when operator's hands are out of danger.

1,212,191. Tilting Headlight. C. V. Dean, Grand Rapids, Mich. Has special provision for leading in supply wires.

1,212,202. Submarine Subterranean and Aerial Telephony. R. A. Fessenden, assignor to Submarine Signal Co., Portland, Me. Transmitter arrangements include tuned circuit of ultra-audible high frequency current.

1,212,224. Electrically Operated Speed Controlling Device for Trains. L. W. Horne and W. N. Crane, New York, N. Y. Valve control.

1,212,226. Calculating Machine. B. F. Hutches, Allendale, N. J. Electrically controlled.

1,212,229. Apparatus for the Production of Oxygen and Hydrogen Gases. W. Jones, New York, N. Y. Structure of bipolar electrode, arrangement of chambers, circulation of electrolyte, etc.

1,212,254. Electric Heater. A. W. Person and J. E. Person, Harvard, Neb. Has sectional built-up support for resistor coils.

1,212,276. Connector. J. C. Stearns, Worcester, Mass. Structural details of device for connecting wire ends.

1,212,282. Electric Fan and Motor Therefor and for Other Purposes. G. S. Tiffany,

assignor to Gray Electric Co., New York, N. Y. Motor is self-starting and has speed controlled by varying interruption of its circuit.

1,212,300. Combined Cut Out and Lightning Arrester for Telephone Systems. H. S. Wheaton, Dallas, Iowa. Main line grounded through carbon resistance and movable contacts connect and disconnect instrument.

1,212,306. Illuminator for Speedometers and Gages. E. S. Abrahams, Indianapolis, Ind. Lamp mounted to illuminate dial.

1,212,326. Trolley Pole Controlling Device. E. A. Colton, Galesburg, Ill. Mechanism for tensioning and releasing the erector spring.

1,212,338. Self-Oiling Ball-Bearing Trolley Wheel. C. Flatter and W. L. Case, assignor of 1/9 to C. H. Stephenson, Alton Park, Tenn. Structural details.

1,212,342. Sound Transmitting System for Moving Pictures. E. D. George, San Francisco, Cal. Is transmitted by telephone from sound-proof booth to individual receivers at seats for audience.

1,212,343. Trolley Retriever. C. E. Gierding, assignor to Ohio Brass Co., Mansfield, O. Details of spring drum device.

1,212,363. Automobile Signaling Device. L. J. Killian, Boston, Mass. Direction indicator.

1,212,375. Illuminating Appliance. E. C. McKinnie, assignor to National X-Ray Reflector Co., Chicago, Ill. Semi-indirect fixture.

1,212,394. Insulator Support. C. L. Pierce, assignor of ½ to Hubbard & Co., Pittsburgh, Pa. Sheet metal pin has clamping member for securing insulator thereon. (See cut.)

1,212,438. Method of and Means for Determining and Indicating the Depth of Water. A. R. Bauder, North Haven, Conn. For determining depth of or pressure of metallic bodies in water about a ship which consists in measuring the conductivity of a circuit including the body of water surrounding the ship.

1,212,449. Spark Plug. C. L. Bundy, assignor of ½ to W. Bohleber, New York, N. Y. Structural details.

1,212,467. Testing of Insulation. S. Evershed, Chiswick, London, England. In installed systems; the insulation resistance is measured at several voltages.

1,212,476. Dynamo. V. C. Goodridge, Chicago, Ill. Has both field and armature rotatable.

1,212,492, 1,212,493, 1,212,494 and 1,212,495. Telephone Exchange System. L. H. Johnson, assignor to Western Electric Co., New York, N. Y. Details of manual systems.

1,212,501. Combination Pliers and Wire Splicers. G. D. Kennedy, Sonora, Cal. For wiremen's use.

1,212,531. Selecting Mechanism. F. R. McMurry, assignor to Western Electric Co. Adapted for use as a current impulse sender and transmitter.

1,212,541. Therapeutical Appliance. F. H. Morse, assignor to Allen Chapman Co., Boston, Mass. Structure of applicator.

1,212,544. Dynamoelectric Machine. A. H. Neuland, San Francisco, Cal. Arrangement of windings, field poles and commutator. (See cut.)

1,212,547. Automatic Insulator. R. A. Parent, South Tacoma, Wash. Automatically grips wire and dispenses with ties.

1,212,554. Electrical Control Mechanism. C. Prachs, Paris, France. Remote control mechanism having Wheatstone bridge arrangement.

1,212,555. Magnetic Chuck. G. G. Pragst, assignor to D. & W. Fuse Co., Providence, R. I. Structural details.

1,212,567. Electric Switch. D. Schneider, assignor to Modern Threshing Cylinder Co., Spokane, Wash. Operated by Bourdon tube.

1,212,603. Fuse. H. H. Baker, Buffalo, N. Y. Structure of fuse block.

1,212,610. Electrode. C. W. Dake, assignor to Pyle National Electric Headlight Co., Chicago, Ill. For arc lamps; changes color of arc when burned away to a certain extent and extinguishes arc when further burned.

1,212,632. Combined Switch and Lock Device. T. A. Hammond and W. P. Hammond, Passaic, N. J. Receptacle cover lock and switch arm controlled by key-operated lock.

1,212,673. Insulator Supporting Bracket. C. L. Pierce, Jr., assignor of ½ to Hubbard & Co., Pittsburgh, Pa. Pin supporting; constructed of sheet metal.

1,212,692 and 1,212,693. Speed Regulator for Phonographs. A. Ruckgabor, Brooklyn, N. Y. First patent: Drag disk geared to record table subjected to magnet adjusted by sound arm. Second patent: Modification.

1,212,694. Fuse. A. Schaanning and S. A. Stugant, assignors to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Has horn-gap terminals.

1,212,699. Electrical Connection. E. G. Smith, assignor to Crouse Hinds Co., Syracuse, N. Y. For attachment to socket.

1,212,703. Disk Type Chain Insulator. L. Steinberger, Brooklyn, N. Y. Structural details.

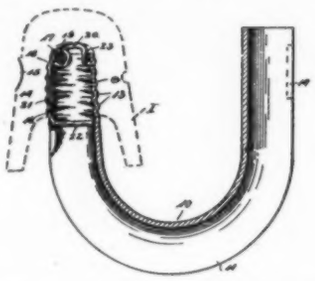
1,212,704 and 1,212,706. Disk Strain Insulator. L. Steinberger, Brooklyn, N. Y. Details of construction.

1,212,705. Telephone Receiver Casing. L. Steinberger, Brooklyn, N. Y. Structural details.

1,212,707. Detachable Connection for Chain Links. L. Steinberger, Brooklyn, N. Y. Connecting member for insulators.

1,212,708. Wire Clamp. L. Steinberger, Brooklyn, N. Y. For suspending wire from insulator.

1,212,709. Electric Horn Control. B. F. Stephenson, Edmonton, Alberta, Canada.



No. 1,212,394.—Insulator Support.

Structure of push button switch for mounting on steering wheel.

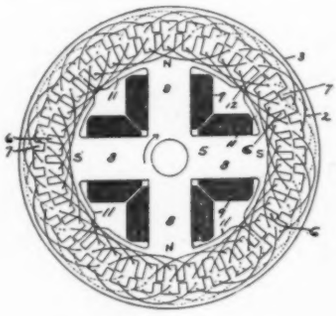
1,212,728. Telephone Exchange System. W. P. Albert, assignor to J. R. Garfield, Cleveland, O. Automatic system with provision for intervention of operator.

1,212,733. Telegraph System. J. H. Bell, assignor to Western Electric Co. Repeating system.

1,212,738. Liquid Coating Composition. A. L. Brown, assignor to Westinghouse Electric & Mfg. Co. For insulating; contains phenolic condensation product.

1,212,746. Lightning Arrester. D. C. Davis, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Structure of horn-gap discharge terminal.

1,212,751. Transmission Dynamometer. F. D. Everett, Saranac Lake, N. Y. For



No. 1,212,544.—Dynamo.

measuring power transmitted in a shaft; comprises a direct-current magneto generator.

1,212,755. Method of Manufacturing Inductance Coils. W. Fondiller, assignor to Western Electric Co. Manner of insulating.

1,212,763. Device for Locating Concealed Conductors. F. J. Gregory, New York, N. Y. Has means for supplying current impulses and telephonic locater.

1,212,774. Magnetically Controlled Mercury Vapor Apparatus and the Like. J. Jonas, assignor to Aktiengesellschaft Brown, Boveri & Cie, Baden Switzerland. Arc is subjected to magnetic field which periodically extinguishes it.

1,212,785. Telephone Attachment. J. L. McMillan, Syracuse, N. Y. In a desk set, amplifying horn when adjusted to receiver lifts receiver from hook.

1,212,793. Packing for Incandescent Lamp Bulbs and the Like. F. C. March, assignor to General Electric Co., Schenectady, N. Y. For preventing breakage in transportation.

1,212,804. Method of Flanging the End of a Metal Tube. T. E. Murray, New York, N. Y. Specially prepared flange is electrically welded to end of tube.

1,212,809. Telephone Exchange System. F. N. Reeves and A. E. Lundell, assignors to Western Electric Co. Automatic.

1,212,836. Lighting System for Vehicles. G. G. Stewart, Roseburg, Ore. Details of automatic circuit-closing mechanism actuated by gear shifting lever.

1,212,867. Electric Switch Contact Holder. Assignor of ½ to M. Dick, Chicago, Ill. Carbon contact-block holder.

1,212,869. Electric Welding Machine. H. R. Woodrow, assignor to T. E. Murray, New York, N. Y. For seam welding.

1,212,870. Device for Picking Up or Lifting Pins, Needles, etc. W. Zolper, Wilmington, Del. Special structure having lifting magnet.

1,212,874. Mechanical Rectifier. F. Adsit, Chicago, Ill. Commutator device.

1,212,907. Battery Lamp. W. R. Clymer, Cleveland, O., assignor to National Carbon Co. Tubular flashlight.

1,212,908. Automatic Telephone System. J. E. Cooley, assignor to Automatic Electric Co., Chicago, Ill. Special busy signal arrangements.

1,212,958. Alarm System. C. A. Kallnbach, assignor to Kallnbach Automatic Fire Alarm Co., Cleveland, O. Thermostatically controlled circuits.

1,213,002. Insulator. F. C. Pierce, Campbird, Colo. Wires secured by wedging in groove.

1,213,011. Device for Connecting Outside Wires to Buildings. P. C. Ragotsky, Philadelphia, Pa. Special form of insulating knob.

1,213,019. Sparking Device. A. L. Riker, assignor to The "Locomobile" Co. of America, New York, N. Y. Make and break device for internal combustion engines.

1,213,035. Instantaneous Electric Socket Attachment. P. Strop, Cleveland, O., Structure of plug.

1,213,066. Wireless Automatic Railway Registering System. C. L. Bopp, Waterloo, Iowa. Train has apparatus having a zone of influence so that stationary relay is operated when train is within certain distance, and is released when this distance is exceeded.

1,213,073. Switch. M. Carr, Maud, Miss. Controller for ignition systems.

1,213,091. Ship Cleaning device. P. Ganz, Des Moines, Iowa. Machine is held to and driven over iron hull by magnetic traction rollers.

PATENTS EXPIRED.

The following United States electrical patents expired on January 23, 1917:

641,682. Dynamoelectric Machine. W. L. R. Emmet, Schnectady, N. Y.

641,709. Process of Plating Aluminum. W. H. Legate, Hartford, Conn.

641,715. Antiseptic Apparatus. J. A. Merritt, Boston, Mass.

641,721. Telephone-Exchange System. F. R. McBerty, Downer's Grove, Ill.

641,737. Registering Apparatus and Circuit for Telephonic Measured Service. G. K. Thompson, Malden, Mass.

641,743. Telephone-Switchboard Apparatus and Appliance. T. C. Wales, Jr., Newton, Mass.

641,748. Adjustable Bracket. T. Smith, Georgetown, Ill.

641,767. Method of Electric-Arc Heating and Apparatus Therefor. H. Drosse, Berlin, Germany.

641,820. Electrolyzing Apparatus. W. Barnes, Lynn, Mass.

641,829. Electric Overhead Railway. L. J. Bruns and H. R. Ottesen, Hanover, Germany.

641,843. Pneumatic Controlling System for Electric-Railway Cars. W. Cooper, Cincinnati, O.

641,853. Wire Joint. A. Gartner, Paterson, N. J.

641,879. Surface-Contact. Electric-Railway System. J. M. Murphy, Torrington, Conn.

641,890. Electric Foot-Battery. D. W. Prosser, Jamestown, N. Y.

641,891. Electric Arc Lamp. E. W. Rice, Jr., Schenectady, N. Y.

641,903. System of Electrical Distribution. C. F. Steinmetz, Schenectady, N. Y.

641,924. Fire-Alarm Box. H. F. Blackwell, Jr., New York, N. Y.

641,927. Quick-Break Electric Switch. W. F. Bossert and G. L. Holton, Utica, N. Y.

641,950. Electric Fire-Alarm System. M. Garl, Akron, O.

641,957. Electric-Lighting Apparatus. G. Heidel, St. Louis, Mo.

641,958. Pencil for Electric Arc Lamps. G. Heidel, St. Louis, Mo.

641,976. Downdraft Electrical Furnace. R. H. Laird, Pittsburgh, Pa.

642,021. Circuit-Changer. A. A. Vanderpool, Newark, N. J.

Reissue 11,804. System of Stopping Steam Engines. A. J. Purinton, Waterbury, and J. R. Reynolds, Hartford, Conn.